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The Adirondack Gold Swindle

The exploitation of the bogus Klondike in the Adirondack region of New York, which has been discredited repeatedly by the JOURNAL and by the state geological survey, has been well illuminated during the last week by the New York *Sun*, always a leader among the daily papers in the exposure of frauds. These Adirondack swindles have been of a particularly noxious variety in that in the main they have been perpetrated upon persons in the rural districts, who are inexperienced in this sort of guile, but it appears that certain smart "promoters" succeeded in putting salt on the tails of some birds in Wall Street.

The Adirondack gold swindles are nearly related to the "gold-out-of-sea-water" fake, but are the direct descendants of the "green-gold" myth, which has been the subject of many essays in the JOURNAL, as our readers know. For the benefit of those whose recollection fails, we shall repeat, briefly, that the earliest form of this myth, so far as we have been able to discover in our researches, was the idea that there exists a kind of gold called "green gold," not with reference to its color but rather to its immaturity (its state of being unripe and imperfect), which escapes detection by the rude methods of the assayer, involving fusion at bright red heat and leading to the volatilization of this tender young gold. By refined methods, according to the exponents of the theory, such gold could be caused to mature immediately and could be extracted in munificent quantity from rock, sand, mud, etc., that did not appear to contain any gold. This myth, according to our studies, dates back to the early days of gold mining in California, but we should not be surprised if it were known to Agricola and possibly in the times of Crœsus.

The survival of this myth and the lingering of the belief in the minds of persons who are not swindlers, though they may fairly be pronounced illiterate, has been one of the curiosities of modern times. Not all of the Adirondack gold "miners" are swindlers; some of them are merely stupid. We have received many communications from them. In one case we caused a test of alleged gold-bearing sand to be made, which was reported in the JOURNAL of Mar. 19, 1910. An Adirondack sand-digger sent us two samples, taken by himself, from which he claimed to get $1.70 to $2.75 per ton, although Prof. Locke, of the Massachusetts Institute of Technology, was unable to get more than a trace. He sent us these samples with the hope that they "may lead to such an investigation under the auspices of the JOURNAL as may settle the matter." We submitted these samples, in the original packages, under the seal of the sender, to A. R. Ledoux & Co. and to Ricketts & Banks, assayers and chemists, of New York, than whom no one stands higher in public confidence. Both of these chemists were warned to be on guard against volatile gold, and consequently they made their assays by two methods, viz., the ordinary fire assay, carefully conducted, and the wet assay. Any young or delicate gold did not have any chance to escape. Both chemists agreed that both samples contained only traces of gold, and neither was able to report any difference between the fire and the wet assays.

It was, of course, to be expected that the swindlers of the green-gold variety would modify their claims on the strength of the theories of the radiochemists. If copper may be transmuted into lithium, why not silicon into gold? Thus we find one of the Adirondack "scientists" leaching sand in a pan containing a slab of secret "radiomagnetic" substance, the discovery and effect of which are explained in the following words of wisdom:

I have been studying radium and its action ever since Mme. Curie discovered it, and when Prof. Rutherford by the use of uranium nitrate transmuted copper into lithium, I went deeper into it. My discovery of this process was almost wholly accidental, however. I was working in a Western mine with some chemicals and threw a certain composition which had failed into a vat with other waste, among which there was some ore. I forgot about it for a few days, and when I looked into the vat again found that all the metals in it had agglomerated. A further investigation showed why they had done so. It was wholly through the radiomagnetic action of one of the elements I had thrown into the vat.

Thus the green-gold myth has completed the circle to the older one of the alchemists. Our notice to suckers is that Adirondack sand contains only green gold and that green gold is the stuff that gold bricks are made of.

American Institute of Mining Engineers

The events at the annual meeting of the A. I. M. E. last week will doubtless have an important bearing upon the future of the Institute. The administration had proposed a series of amendments to the constitution. These aroused much opposition among the membership, but this did not take an organized form until nearly the last moment, when it was crystallized by a circular signed by 20 members asking for proxies. The response was immediate, manifesting the wide-spread feeling that a change in the policy of the Institute was desirable, and the "insurgents" were put in a position to control the meeting and carry out their program.

Their program was temperate. The opposition had been centered upon the proposal to increase the dues. It was not denied that an increase might be necessary and the way to carry out that intention without delay was left open, but it was held that this should not be done until it had been determined by an independent committee that it is an unavoidable expedient. This, of course, involves a study of all of the affairs of the Institute.

A resolution to this effect was passed at the meeting, a committee of five being named coincidently. The constitution of this committee was distinctly conservative, it being manifested thereby that the spirit of the opposition was not to be hostile to the previous régime, but rather to be helpful.

There has never been any suspicion that there have been any improprieties in the conducting of the Institute, but there had been a feeling that the running of its affairs from headquarters had settled into ruts, and especially a feeling that the organization had in late years failed to be as helpful to its membership as it might be.

Mr. Kirchoff, the retiring president, strove earnestly during his term of office to improve things and accomplished a good deal, and it was universally regretted that he was unwilling to take the presidency for another year. The Institute was fortunate, however, in obtaining the services of Professor Kemp, who is held in the highest esteem on all sides. While there was a full appreciation of the self-sacrifice and accomplishment of the president and officers of the Institute during the last year, it was considered that something might be gained by a study of the affairs of the Institute from a new angle. This is a duty that has devolved upon the committee of five.

The responsibilities of this committee are heavy. Upon its report and recommendations will be based probably the future policy of the Institute. It is recognized that the Institute by merely supplying to its members a collection of excellent technical papers does not wholly meet the expectations of its members. The main problem is to make the organization more generally useful. In this the members themselves have responsibilities. The best things come to those who help themselves, not to those who are merely helped. For a successful rejuvenation of the Institute, there must be a general coöperation. The interest that was aroused in the last annual meeting, which was better attended than any other for a long time, is ample evidence that the membership of the organization is capable of attention to its affairs.

Steel Profits

The passing of its preferred-stock dividend for the quarter recently closed, by the Republic Iron & Steel Co., is attributed by its published statement to the low prices of finished products that have prevailed for several months. No complaint is made of the volume of trade, the company stating that 90% of its mill capacity is employed. The Republic last fall started the movement which developed into the the present conditions of low prices and large business, and it is the first company to make open complaint. Undoubtedly the low prices have reduced the margin of profit in the iron and steel business, though there has been much compensation in the way of increased work and the fuller employment of mills. The Republic company, however, has generally worked on a narrow margin and has several times before been obliged to pass its dividends. It has rather a loosely joined organization, covering a number of plants, North and South, and was heavily capitalized, after the fashion of the trust development of 10 or 12 years ago. Notwithstanding the complaint of low prices, it earned a substantial surplus, though not quite sufficient to meet its dividend requirements for the quarter. Other companies may find their net earnings reduced; but it is probable that results will be better, on the whole, than if the conditions of last summer had continued.

The opening discussion on the anthracite wage agreement is now going on in New York between committees of the operators and miners. Since the last strike the trade has been carried on substantially under the agreement formulated by the Anthracite Strike Commission of 1902; but now the miners have demanded an advance of 20% in wages and an eight-hour day for all day labor. The operators have announced that they are not ready to grant such concessions, and it remains to be seen whether any compromise can be reached. The western discussion over the wage agreement is at a standstill, both parties apparently waiting for the result in the East. The conference on Feb. 27 reached no result and adjourned for a week. The outlook in the anthracite field is ominous.

Canadian iron production in 1911 was the largest ever reported, approaching nearly 850,000 tons, a quantity nearly 10 times that reported 12 years ago. Nova Scotia and Ontario both contributed to the increase. The production is largely of basic iron, and the openhearth furnace is the chief steel producer in the Dominion.

French and German producers of aluminum are again reported to be negotiating to end the competition which has kept down prices. The result is uncertain.

Metallics

An iron washer, or small iron weight, free to move on a laboratory screen, greatly hastens the screening operation.

Based on Rowland's determination of the mechanical equivalent of heat (1 B.t.u. equals 778 ft.-lb.), 1 kg.-cal. equals 859 kw.-hr.

For permanganate iron titrations the use of a titration mixture of $MnSO_4$, H_2SO_4 and H_3PO_4 is often proposed. It appears that H_3PO_4 alone is equally effective. Use about 5cc. of sirupy acid.

In shaft sinking, it is advisable to cut good roomy plats at first, as the subsequent enlargement of a small plat is troublesome and relatively more expensive.

The electric properties of Monel-metal wire which has lately been put upon the market are as follows: Electric resistivity, 256 ohms per mil-foot. (The temperature coefficient is 0.0011 per deg. F.). Electric conductivity, 4% on the basis of 100 for copper.

Dredge buckets are now usually made of three parts, with a cast-steel base, pressed-steel hood, and manganese-steel lip. All-manganese-steel buckets are being tried, however, on one of the new dredges in the Oroville district in California. The all-manganese-steel buckers being tried at Oroville are made with the base and hood in one piece, to which a manganese-steel lip is attached.

Where tie-rods are used in parts of a mill building subjected to intense vibration, the nuts can be prevented from working loose and dropping off by threading the ends of the rods an inch more than necessary to take the nut. The nut is turned down tight until this extra inch of threaded rod protrudes. The protruding end is slotted longitudinally for ¾ in. with a hacksaw and the end of the rod slightly expanded by driving the point of a blunt wedge into the slot so as to spread the ends of the rod.

It is suggested (*Revue de Chimie Industrielle*, Jan, 1912) that the temperatures of fusions of various mixtures of salts could be used for the determination of the temperatures of metals which are being worked. The following fusion temperatures are given: Calcium nitrate, 550° C.; barium nitrate, 600°; potassium iodide, 682°; potassium bromide, 730°; potassium chloride, 775°; sodium chloride, 800°; sodium carbonate, 810°; sodium sulphate, 865°; barium chloride, 955°; potassium sulphate, 1070°. The following mixtures give certain intermediate temperatures: Sodium and potassium sulphate in equal parts, 850°; sodium chloride, 42 parts, potassium chloride, 58 parts, 665°; chloride of sodium, three parts, bromide of potassium, seven parts, 625 degrees.

By the Way

Some of the Wyoming asbestos companies that have been selling large quantities of stock to the public are being investigated by the U. S. Postal Department. Unless these stock issues were printed on paper made from the companies' own product so as to stand the test of fire, there would seem to be a warm time in prospect for some of the promoters.

A truly remarkable statement appearing in the prospectus of a copper company has been brought to our attention. It is as follows: "Attention! For reasons best understood by mining men, stock in this company is not as safe an investment as Government bonds, or cash in a bank; and we advise no one to encumber his home or an assured income to obtain funds to invest in the stock of this company." This is certainly remarkable and very likely to be true.

While the following is not strictly germane to mining, it may, by analogy, strike a responsive chord with some of our readers. Mr. Harcourt, at the British North Borneo dinner, said that a city friend was approached with a view to floating a rubber company. "How many trees have you?" he asked. "We have no trees." "How much land have you?" "We have no land." "What, then, have you?" "I have a bag of seeds." The latter seems to be the "rubber" equivalent for an option.

The Russian government has granted concessions for the building of a system of railways in the territory south of the Siberian Ry. in the valley of the upper Obi, on the west slope of the Altai Mountains. These lines will facilitate the opening of the mineral deposits—copper, silver-lead, iron and gold—known to exist in the Altai, but now unworked on account of the cost of transportation. One line is to run from the Siberian Ry. south by west to Barnaul, Semipalatinsk and Bivsk, about 500 miles. The other is from Aris, on the Oremburg Ry., eastward to Pishpek and Wiernsk, about 400 miles. From the last named line an extensive can be readily built into Mongolia.

Commissioner Lane, of the Interstate Commerce Commission, says: "We are going to prosecute the express companies for overcharging the public. This investigation was made for the purpose of developing the facts in this regard. The commission has 3000 complaints of overcharges, and 10,000 letters on its file complaining of this practice." When asked if he meant criminal prosecution, Lane answered: "Certainly I meant criminal prosecution. The facts will be presented to the federal grand jury at the proper time." The investigation by the Interstate Commerce Commission was based on alleged extortion and unequal rates; overcharges and over-weighing; collections made at point of delivery on prepaid packages; inefficient service; combination with the railroads, and usurpation of governmental, banking and commercial functions.

The *Congressional Record* discloses that Victor Berger, the Socialist member, and a San Francisco newspaper have become convinced "that a conspiracy exists among the officials of the Treasury Department to close the refining branches of the United States mints and to turn over to the smelting trust the business of refining gold and silver bullion intended for coinage." The contributions of the present Congress to the knowledge and practice of the mining industry have been more or less remarkable—one might also say, fictional.

Lost mines are not unknown in this country; it seems that there are some in Europe also. A correspondent sends to the *London Mining Journal*, from Stavanger, a description of the discovery last summer of a legendary old mine near Todalshaug, Molde, in Norway. According to local tradition, a gold mine was worked at the spot up to the beginning of the 17th century, when, owing to an incursion of about 900 Scotsmen, under the leadership of a certain Captain Sinclair, who landed in 1612 with a view to passing into Sweden through Norway, the mine was covered up, and, despite occasional efforts at discovery, its precise location was forgotten. The invading force was almost annihilated in the neighborhood, but a few survivors inter-married with the population, and the tradition has been strengthened by the evidence of a Scotch type among some of the inhabitants of the valley. The last effort to discover the mine seems to have been made about 50 years ago, but without success, and the recent find is the result of an accident. The particular spot is only visited during the summer months, when the cows are taken up to high pasture. Last summer, when the animals were driven up, it was found that a landslip had occurred during the spring, and that about 3000 tons of débris had been carried away, and an old shaft 9 ft. long and 6 ft. wide, plugged with round timber, more or less petrified, stood revealed. There still exist the remains of an old quay from which, presumably, ore was shipped in ancient times. The correspondent writes further that he has sampled the ancient dumps, the assays showing gold, silver and 16 to 18 per cent. copper. He thoughtfully adds that there are waterpowers close by, which will furnish 150 hp. or more. After which we are not surprised to hear that "it is hoped this mine will soon be reopened." Probably the Lost Mine of Norway, Ltd., will soon be floated in London. The existence of "inhabitants of Scotch type in the valley" gives a fine air of truthfulness to the letter.

William C. Wetherill

William Chatlin Wetherill died suddenly at Denver, Colo., Feb. 10, aged 60 years. He had been connected for 23 years with the operations of the New Jersey Zinc Co. and its subsidiary companies, and was well known and highly esteemed both as an engineer and for his personal qualities. He was born at Newark, N. J., in 1852, his father being Col. Samuel Wetherill, inventor of the Wetherill process for making zinc oxide. The whole family, in fact, was concerned in zinc metallurgy, his brother, John Price Wetherill being the inventor of the well known Wetherill magnetic separating process, while another brother, S. P. Wetherill, was for many years a paint manufacturer in Philadelphia.

William C. Wetherill graduated from the Philadelphia Polytechnic School as a civil engineer, and studied for a time at Lehigh University, being in the class of 1870. His first professional engagement was with Charles F. King on some railroad work in Pennsylvania. In 1878 he went to Brazil as locating engineer for the Madeira & Mamoré R.R. in that country. Returning to the United States in 1880 he was for a year employed in the location of the Northern Pacific line in Montana and then went to Mexico as chief engineer of the Mexican National under Gen. W. J. Palmer. In 1885 he located the very difficult line of the Beech Creek R.R. into the Clearfield coal district in Pennsylvania. After a few years (1885 to 1889) spent in railroad contracting work with Charles F. King, in Missouri and Virginia, he became engaged in zinc mining and smelting, taking the position of general manager at Joplin for the Empire Zinc Co., of Missouri, which later became a subsidiary of the New Jersey Zinc Co. In 1901, after the dismantling of the Empire works, he removed to Denver, having been chosen vice-president and consulting engineer of the Empire Zinc Co., of Colorado, which position he held up to the time of his death.

Mr. Wetherill leaves a widow and two daughters. He was a member of the American Society of Civil Engineers, the Colorado Scientific Society, the Franklin Institute and the Engineers' Club of Philadelphia; also of the Sons of Colonial Wars, the Madeira & Mamoré Association and the Denver Athletic Club. He was the author of several technical papers, chiefly written for the Colorado Scientific Society.

Mr. Wetherill was one of the most charming of men and was esteemed and loved not only by his wide circle of friends, but also by a host of acquaintances. His death is felt keenly as a personal loss by all of these. There are few men possessing finer qualities as a man and a friend than W. C. Wetherill. His professional career was long and honorable and useful.

Butters Wins First Decision in Filter Litigation

The suit brought by the Moore Filter Co. against the Tonopah-Belmont Development Co., Tonopah, Nev., on the ground that the Butters filter plant installed at the Tonopah-Belmont mill infringed the Moore process patent, was decided in favor of the defendants by the U. S. District Court, at Trenton, N. J., this week. This case has been in controversy since early in 1908.

From the first, the Butters company assumed the burden of the defense and it became virtually a test case to determine whether the Butters patents in the United States were distinctive; there was no question as to the validity of the Moore patents.

The basis of the decision of the court was that the stationary type of filter is not the equivalent of the Moore movable type. Since the Moore Filter Co. exclusively controls the Cassel patents, which are claimed to be the basic patents on all the stationary types of filters, an appeal will be taken immediately and will probably be heard before summer.

The Bonanza Dividend

Initial distribution of $1,000,000 by the mines at Kennecott, Alaska, known as the Bonanza group, and owned by the Morgan-Guggenheim syndicate, seems large on the mines' capitalization of $2,500,000, but is small when the amount spent on the mines and the Copper River R.R. by the syndicate, upward of $23,000,000, is taken into consideration, says the Boston *News Bureau.*

The Copper River R.R. is paying its own operating expenses, but it will be a long time before the road can meet its interest charges, which would total $1,000,000 per annum at 5% on $20,000,000 invested. The Copper River R.R. has been able to operate by installing oil burners on its engines and bringing oil from California.

The Bonanza mines have, roughly speaking, about 100,000 tons of copper ore averaging more than 65% copper, of which approximately 16,000 tons have been extracted. Engineers who went over the mines estimated that they contained ore which would yield profits of about $6,000,000, or a net of $3,000,000 when the time elapsed necessary to extract the ore and the interest during that time on the money invested are taken into consideration. The properties cost the syndicate $3,000,000. It was never thought that the profits on the Bonanza mines would give a profit on the mines and the railroad investment combined. Return on the railroad investment was expected to come from the opening up of the Alaska territory and the development of coal lands and mineral-bearing properties by outside capital.

Smelting Trust Inquiries

WASHINGTON CORRESPONDENCE

A sudden flurry of interest in the so called "smelting trust" during the last week has produced two resolutions of inquiry in the House of Representatives. The first is by Mr. Martin, of Colorado (No. 419), and provides:

> Resolved, that the Attorney General be hereby directed, if not incompatible with the public service, to inform the House whether the Department of Justice has in its possession any information touching the existence of a smelting trust in the United States, including the American Smelting & Refining Co.; whether complaint of the existence of a smelting trust, or touching the operations of the American Smelting & Refining Co., as the same might be affected by the Sherman anti-trust law, has reached the Department of Justice; whether any steps have been taken or are in contemplation to investigate the existence of or prosecute any smelting trust; together with copies of any information touching the existence and operations, if any, of such trust.

The other resolution was introduced by Victor Berger, of Wisconsin, who wishes to have a report as to whether the smelting trust was in a conspiracy with the Treasury officials to close the refining branches of the mint and to turn this business over to the smelting trust.

Naumkeag Copper Co.

The Naumkeag Copper Co. is to be formed to take over properties at Houghton, Mich., on the south side of Portage Lake, comprising the Dakota (200 acres), South Side (200 acres), land of the Canal company (160 acres), Naumkeag (400 acres), Pacific (140 acres), Sheldon-Douglas (160 acres), total, 1260 acres. The new company is to be organized on the basis of 200,000 shares of par value of $25 each. Of the capital stock, 102,000 shares, marked $10 paid in, is to be issued immediately in payment for the properties and to put $253,000 in cash in the treasury. The new company is financed by the General Development Co., with the distinct understanding that it is a development venture and not a proved mine. The General Development Co. and its associates will control about 56,000 shares of the stock issued, which holding will be pooled, pending developments, and no stock will be offered to the public by the General Development Company.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Soldering Aluminum

Will you please advise me as to whether there is any simple and reliable system of soldering aluminum?

G. H. R.

[According to Joseph W. Richards, aluminum can be soldered by an alloy of 78.34% Sn; 19.04, Zn; 2.38, Al; and 0.24, P, the last serving as a deoxidizer. In later practice the solder was made by melting together 1 part phospor tin, 11 parts zinc, and 29 parts tin. It is claimed by C. H. Land (ENG. AND MIN. JOURN., Jan. 21, 1911) that aluminum can be soldered by immersing the edges in molten tin and scratching with a steel scratch brush while immersed, until a coating of tin is formed, after which the pieces can be soldered together with ordinary solder.

In *Power* (Feb. 27, 1912) the following methods are also given:

"Aluminum can be readily welded electrically, but soldering is not satisfactory. The high heat conductivity of the aluminum withdraws the heat of the molten solder so rapidly that it "freezes" before it can flow sufficiently. A German solder said to give good results is made of 80 per cent. tin and 20 per cent. zinc, using a flux composed of 80 parts stearic acid, 10 parts chloride of zinc and 10 parts chloride of tin. Pure tin fusing at 480 deg. F. has been employed as a solder, and soft solder with chloride of silver as a flux has also been used."

In welding aluminum by the oxyacetylene blowpipe, it is necessary, to obtain the best results, to use a flux on the portions to be welded (*Brass World*, Feb., 1912). This flux answers a two-fold purpose: (1) It protects the metal from oxidation when melted by the blowpipe flame. (2) It serves to dissolve the oxide formed on the surface of the molten metal.

According to a process recently patented by the Aktien Gesellschaft für Autogene Schweissung, of Zurich, Switzerland, the following flux is excellent:

Potassium chloride....	50 parts
Cryolite	6 parts
Calcium chloride.....	30 parts

These proportions may be varied, if desired, but the quantities given are used for ordinary work. The best results are obtained by melting the whole together and then pulverizing before using on the aluminum. This gives a homogeneous mass of the flux which melts evenly.—EDITOR.]

Where the Primer Should Go

In the JOURNAL of Feb. 17, 1912, Percy E. Barbour asks the question: Where should the primer be placed? The answer to this question seems to me clear. It all depends upon the kind of fuse used to ignite the detonator.

My reasons for making this statement are; that it is generally conceded that in using high-grade explosives the intensity of the explosion varies with the strength of the fulminate detonator; that the detonator acts with diminishing effect as the distance from the detonator is greater; that the greatest burden or resistance that the explosive must overcome to break the rock, is usually at the bottom of the drill hole, and that explosives of the type of dynamite not only fail to develop their full strength when burned instead of being detonated, but the gases evolved from burning dynamite are more noxious than those evolved from its detonation.

The inference naturally drawn is, that since the greatest resistance is at the bottom of the hole the dynamite at that point should be exploded so as to develop its maximum force; therefore the primer should be placed at or near the bottom of the hole. This is the proper place for the primer when the cap is electrically detonated.

It might be well here to mention some of the ways electric detonators are placed in the primer. They are inserted by opening one end of the cartridge, forcing a small pointed stick about the shape and size of a lead pencil into the powder, and then inserting the cap. The paper wrapper of the cartridge is then wrapped about the wires and securely tied. As a precaution against pulling out the wires during loading of the hole, they may be doubled back so as to parallel the cartridge, the wires being securely tied to the cartridge at two places, preferably an inch or two from the ends. The primer may also be inserted in a hole punched in the side of the cartridge with the pointed stick tying the wires to the sides so as to hold the cap securely in place. The angle of the cap to the wires at the side of the cartridge should be obtuse as an acute angle necessitates a sharp bend in the wires that may break the sulphur filling of the cap. In blasting in wet ground the cracking of this sulphur filling may admit water to the fulminate, and interfere with or prevent its detonation. Never should the cap be held in place by making a half hitch around the cartridge with the wires. It takes more time to tie in the caps with string and thus secure straight wires, but it is a precaution that should be insisted upon.

The method of inserting the electrically detonated cap in the end of the cartridge is preferable to side insertion as the cap is then more protected by a cushion of powder all around it and there is less possibility of abrading the insulation that might result in laying the wires bare and cause a short-circuit; hence a misfire.

It is obvious that the primer can be placed in the bottom of the hole either with the cap at the bottom, if the wires are doubled back, or at the top if not so doubled. In the second method the cap will be in the upper end of the first cartridge and close to the lower end of the second. It would probably detonate the second cartridge more forcibly than if the cap were at the bottom of the hole, although to all practical purposes the two end sticks might be regarded as equally detonated whatever the position of the cap.

ALTERNATIVE FOR ELECTRICALLY DETONATED PRIMERS

With the doubled-back wires perhaps the best position of the primer is just above the first-placed or bottom cartridge with the cap end of the primer or second cartridge introduced into the hole first. The bottom cartridge then acts as a cushion that prevents any chafing of the wires, during tamping, that might take place against the rock at the bottom of the hole if the primer were used at the bottom; the pressure might be enough to crack the sulphur if not enough to abrade the insulation. A little clay tamped into the bottom of the hole will also provide a good cushion as a precaution against chafing. The chafing of the wires is probably a greater consideration than any difference in detonating effect arising from the position of the cap. Using the primer as the second cartridge, therefore, has an advantage over using it at the bottom, but if carefully introduced, there is not much greater risk of short-circuiting by using the primer at the bottom.

As a further precaution against short-circuiting some blasters separate the two wires just above the inserted cap and double each wire back separately so that they are on opposite sides of the cartridge, uniting them again at the other

end and securely tying them in position on the cartridge with string.

At some mines it is customary to slit the sides of the cartridge with a knife so that the explosive will swell out and completely fill the hole when tamped. When this is the practice the electric cap should never be inserted or poked loose down the hole into the charge. Use a primer cartridge as usual without slitting its sides as in the case with the other cartridges of the charge, or else slit it and force carefully and gently into position so as not to break the powder out through the slit. A primer should be gently tamped if at all to break out the powder through the slits. In blasting deep holes it is not unusual practice to use more than one primer at intervals in the charge and connect the wires in series.

Electric detonators are rarely used in mines because in such work it is desirable to fire a number of rounds of holes with an appreciable interval between them. It is not practicable to fire several groups at intervals by electricity by laying separate wires from the blasting-machine to the face, but delayed-action detonators are now being introduced so that a time interval will elapse between each successive group and with only one operation at the blasting-machine. There is no danger of igniting dynamite when using electric detonators as a short-circuit will not develop a spark sufficiently hot to ignite the powder. The wires of all the caps in the charges are wired together in series and it is possible to send a small yet measurable current through the circuit to test the connections before sending through a current that will detonate the caps. The delayed-action caps should interest mine operators in the possibilities of using electric detonators in all work and doing away with ordinary fuse altogether.

No Option When Using Fuse

When using ordinary fuse there is but one place for the primer: the top or last cartridge to be inserted. This is because there is danger of setting fire to the dynamite if the fuse has to burn through it before reaching the cap. The primer has no place in any other part of the charge. It should also be stated that the cap should be inserted by opening the end of the cartridge and inserting it to no greater depth than two-thirds the length of the copper shell. The warpper is then wrapped about the fuse and securely tied in such a manner as not to compress the fuse itself. If the cap is entirely imbedded in the cartridge or placed in the side of the cartridge, the fuse may set the powder afire. The loss of force through burning of the powder will be greater than any difference in explosive force arising from remoteness of a given cartridge from the primer. Even with only two-thirds of the cap imbedded in the powder, it may be pressed in flush with the top of the cartridge by the tamping.

There is, I believe, a tendency to avoid using strong caps. This is not as it should be and in few cases will the saving warrant the practice. Personally I have always preferred using not weaker than a No. 6 cap and when using low-grade dynamites a No. 8. A strong cap always insures a strong detonation of the charge, and the lower the grade of the dynamite the stronger should be the cap.

In opencut mining mixed explosives are used, such as dynamite with black powder. The ratio of dynamite to powder is usually small, the former really acting as a detonator that ignites the black powder by its flash. In coal-mining practice some miners reverse this order and place the dynamite at the bottom of the hole without a cap, the black powder igniting the dynamite. The claim is made that the stronger explosive terminates the shot at the back, giving a clean break. It is claimed that in such practice the dynamite detonates, but I think this extremely improbable. These miners also state that placing the dynamite at the top and using it to ignite the powder causes excessive shattering of the coal at the outer side. In metal mining I do not see that these conditions enter the question at all. The black powder is ignited by the flash of the primer and, as black powder takes an appreciable interval to burn, placing the dynamite at the bottom would cause the propagation of ignition in an upward direction and give rise to a tendency to produce a blown-out shot. It seems to me that, in consideration of this, in mixed-explosive blasting the proper place for the primer is at the top of the charge whether fired by fuse or electric detonator.

In conclusion I would state that in all mixed-explosive blasting and where fuse is used the primer should be placed last or at the top of the charge, and when using explosives of the dynamite type with electric detonators, at the bottom or, perhaps better, next to the bottom or first cartridge used.

Clarence C. Semple.

New York, Feb. 26, 1912.

The Metallurgy of Nickel

Not long ago I wished to make some studies on the metallurgy of nickel, and was surprised to find that there seemed to be no book on that subject, but that all the available literature consisted of short chapters in general metallurgies, or of scattered references in the technical magazines. The greatest source of trouble seems to be that the production of nickel is largely in the hands of one or two producers who earnestly discourage publication of their methods. Nevertheless there must be enough scattered knowledge among the members of the engineering profession to make a fairly authoritative treatise, if it could all be gotten together. Some years ago the Journal opened its columns to a discussion of the art of pyritic smelting. Why couldn't the "Discussion" page be used for a time for the publication of informal notes on the metallurgy of nickel. Judging from my reading, the following topics would all be of interest: What is the true efficiency of the top-and-bottom smelting process, i.e., how clean a separation can be made of nickel and copper by this method? What is the electrolyte and current density used in the electrolytic refining process? Where are the precious metals taken out and how? Is the method given in the textbooks of fractionally separating nickel and cobalt by bleaching powder in commercial use?

E. F. Hopkins.

Cincinnati, O., Feb. 1, 1912.

San Francisco Mine, Oaxaca

In the Journal of Jan. 6, 1912, under the heading "Mining in Oaxaca in 1911," it is stated that "the San Francisco mine is now idle." I wish to inform you that this is not the case. The mine has not been idle at any time during the last year, and development is still being carried on. The mine has not been shipping heavily for the simple reason that freight and smelting charges are about $25 per ton, but it is the intention of the company to erect a mill as soon as conditions in Mexico improve. As the statement in the Journal has been read by shareholders in this property, who live in various parts of the United States, I ask you to make this correcting statement.

Tehuantepec Silver Mines Co.,
E. W. Hockley, Manager.

Taviche, Oaxaca, Feb. 8, 1912.

Stratton's Independence Mill

My attention has been called to the article on Stratton's Independence mill, by Messrs. T. C. Linderfelt and J. K. Stewart, published in the Journal of Feb. 10, 1912. This description of our mill and methods is unauthorized, mostly untrue, quite unreliable and unworthy of serious attention.

Philip Argall.

Denver, Colo., Feb. 15, 1912.

[The article in question was essentially of a merely descriptive character, in which class of article error is least to be expected. We have become convinced that it is seriously erroneous and that its authors imposed upon us in spite of the scrutiny of their MS. that we thought was careful.—Editor.]

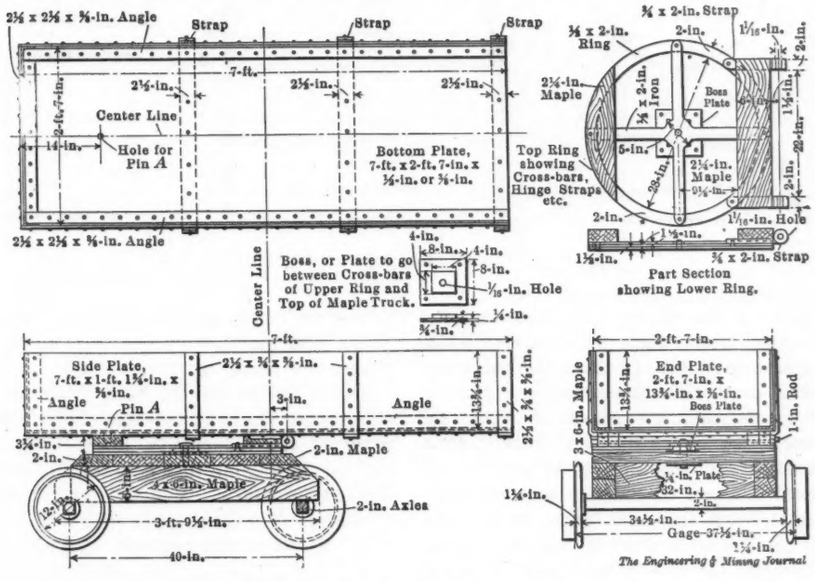
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent to telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Tram Car for Stope Filling

The accompanying drawing shows the details of construction of cars used in the stopes at the Copper Range mines at Painesdale, Mich., where a waste-filling system of mining is used. These cars hold a ton of waste and have the long, low bodies characteristic of copper-country mine cars. In this way the height that the shoveler has to lift the ore is kept low.



TRIMOUNTAIN CAR FOR STOPE FILLING

The long body is of advantage in spreading the filling, as it allows the filling to be dumped somewhat farther to one side than could be done with a car with a short body. The body of the car is fastened to the truck by a hinge carried on a turntable on the truck frame. Owing to the speed with which the maple decays underground, the wooden truck is now being made of fir. Some of these cars are equipped with Peleter bearings just like the main cars on the level, while others have ordinary bearings. The bolt going through the hinge can be taken out easily when the car is to be raised into or lowered out of the stope, and the body can be dismounted for handling it through the chutes.

Support at the Bottom of a Stope

BY CLAUDE T. RICE

An interesting problem in mining exists at the No. 8 Hecla shaft of the Calumet & Hecla Company, at Calumet, Mich., where a pillar 200 ft. high, measured along the dip of the lode and extending from Hecla No. 7 to Hecla No. 8 shaft, a distance of 800 ft. is being mined. This ground was left under No. 47 level when that level drained a certain part of the mine.

All the ore down to that depth has been worked out except the shaft pillars 85 ft. wide on each side of the shafts and the old level pillars about 18 ft. high, measured along the slope of the vein that were formerly left under each level. Below the No. 47 level practically all the ore has been mined out to the No. 60 level. Apparently the ground both above and below this block of ore has closed in and filled the old stopes. This has thrown a considerable weight upon the roof, as is apparent from the swelling of the floor of the drifts leading to the stopes in this block. On the No. 48 level a drift stope was run some time ago 20 ft. wide along the dip and about 6 ft. high, but now this opening, with the exception of the drift along which are cars run, and which is maintained by heavy timbering and constant easing, is almost entirely closed in.

The conglomerate bed is 16 ft. wide in the block in question and rich, probably averaging 4 per cent. copper from foot to hanging wall. The ore is being breasted out in overhand stopes 100 ft. long that are timbered with three-post stull sets of the usual Lake Superior type. These are set at centers of about 6½ ft. apart, both in the direction of the dip and of the strike of the bed. The dip is about 38 deg. Below the No. 49 level there is supposed to be a pillar of ore about 15 ft. thick measured along the dip of the lode.

Stoping began on both levels from No. 8 shaft, the stopes being started on both levels at the far end of the block with a pillar 100 ft. wide left next No. 7 shaft. The stope on the No. 48 level was started first, and in both stopes there have been until recently two machines working, the miners working on contract. Owing to the slowing up of the mining in the upper stope, due to the great weight on it which is continually crushing the timber and delaying the drilling, the lower stope has caught up with the upper, and both are now about 75 ft. up from the level.

In the upper level the roof has become so heavy that the stull sets in the lower 25 ft. of the stope have broken so that it has been necessary to build in solid between the broken stulls in order to keep the roof up and maintain a passageway for the ore to the level. Broken pieces of timber about 4 ft. long are used so that the bottom of the stope is composed of a series of rough bulkheadings built up tight against the hanging with ore passes through them about 3 or 4 ft. wide. Above the lower 25 ft. there is about 25 ft. of stope in which at least one post of each stull set is broken, while in the top part of the stope the timbering is in fair condition. Working in the ground has been going on for about seven months so the weight is not due to slow mining. The back in the upper stope is tightly laced as soon as the timbering is put in, although when first mined it is in fair condition.

In the lower stope there is not a single set that has given away from crushing, although a few posts have been broken by boulders that have come down the stope from blasting. The roof in the lower part of the stope is tightly laced, but in the the last 15 ft. it is in such good condition that no cap piece is being put in, although a block is placed under the top blocking of the leg post of the sets so that a cap piece or wall timber to carry the lacing can be put in later if necessary.

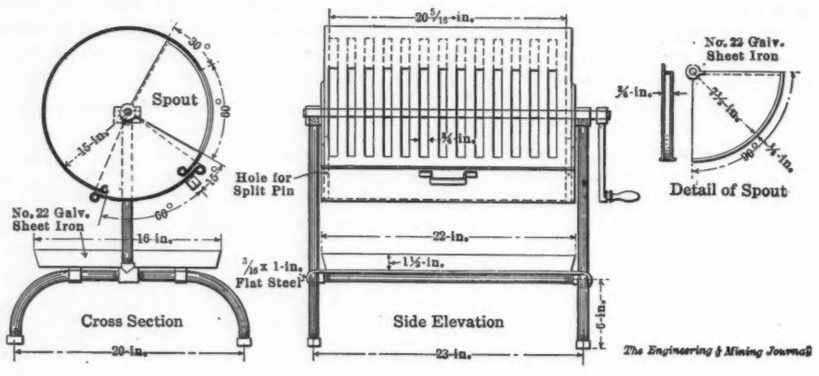
In both stopes the width of ore from foot to hanging wall is the same, 16 ft., and outwardly there is no reason why the weight should be so different except because of the manner in which the two stopes were started. In the opinion of the mine captain, who has been working in the conglomerate lode for many years, the fact that he decided to leave a ledge of ore at the bottom of the lower stope instead of opening clear across the lode, as he did in the upper stope, is the only explanation; at least that was the way it appeared on going through these stopes. It would seem as though in the upper stope the continuity of the arch had been broken and so even at the bottom when the stoping had only fairly begun the ground was heavy. In the lower stope the ledge of ground that was left served to carry the support from the level pillar to the roof, consequently, there was no settling of the roof in the lower part of the stope like in the top stope, while the cutting-out stoping was being done to make room for timbers, and so the roof in the rest of the stope did not move as appears to have been the case in the upper working.

On the other hand in the upper stope, as there was no ledge of ore to help arch the back while the cutting-out stoping was going on there was a chance for the hanging wall to settle. This happened, and after it once had started, timbers were unable to hold up the roof. Bulkheads had to be put in between the broken stulls, but even they could not stop the settling until they had been compressed thoroughly. This settling of the roof in the bottom of the stope permitted the roof in the upper part also to settle, and consequently, owing to the roof at the bottom being cracked and broken, the roof over the whole stope got in motion. In the other stope, the roof at the bottom was held up by the arch until timbers could be put in, which were then able to hold the roof as the arch was not cracked and there was a good brace of solid ground extending up from the level. Therefore, as the roof in the upper part of the stope could not, as it were, slide downward parallel to itself through settling of the roof in the lower part of the stope, it did not crack, and consequently even near the top, when approaching the heavy ground of the stope above, the roof does not need to be laced to hold it up.

This instance shows the importance of keeping the roof in the form of an arch as much as possible, especially at the bottom of a stope, so that there is a solid ledge of ore for the hanging wall to stand on. If motion can be prevented in the roof of a stope, the ground does not become very heavy, but once anything starts it to moving, each inch of movement at the bottom allows the rock above to move the same amount, seams open up and the whole roof of the stope becomes bad.

A Sample Reducing Machine

The sample reducing machine, the details of which are shown in the accompanying drawing, was designed by E. W. Miller for the Bureau of Mines, for the special purpose of reducing samples of coal, but which can also be used for sampling other minerals. In this machine an attempt has been made to combine the mixing and reducing of a sample in one piece of apparatus which shall be portable and cheap to build which shall protect the sample from drying air currents, and by means of which the work can be easily and quickly done. Preliminary experiments with this apparatus seem to indicate that these requirements and have been fufilled and it is believed that it will be found suitable for use either with a power or a hand crusher.



SAMPLE MIXING AND REDUCING MACHINE

The machine consists of a cylinder of galvanized sheet iron hung on a horizontal shaft passing through its axis by means of which it may be revolved. The cylinder is left open on one side for its full length and for 60° of its circumference, a sliding door concentric with the cylinder being provided to close this opening. The cylinder is further provided with a series of sectoral spouts open to the exterior of the drum for 60° of their arc and entirely on one edge in the interior of the cylinder. The spouts are ¾-in. wide and are spaced ¾-in. apart, the radial edges of the spouts forming an angle of 90° at the center of the cylinder.

The operation of the machine is as follows:—A quantity of crushed coal, which should never be more than enough to fill the cylinder half full, is placed therein, the door is closed and the crank turned in an counter-clockwise direction. None of the coal can now fall out, but it will be thoroughly mixed by the repeated plowing of the spouts, closed side first, through the mass. After several revolutions, the direction of rotation is reversed. There is now presented to the coal a series of vertical planes which divide it into a number of equal portions, each alternate portion falling out through the openings in the cylinder wall. With each revolution of the cylinder in this direction, half of its contents is thus discarded and with a little practice it is possible to judge by the amount falling out each time, when the sample has been sufficiently reduced. When this point is reached, a pan is placed under the cylinder and one revolution with the door open, serves to discharge the final sample.

This machine may be built in any desired size. The machine here shown was designed for reducing a 50-lb. sample, the intention being to use it for samples already partially reduced by other methods.

List of Water Equivalents

The U. S. Geological Survey is authority for the water-measurement equivalents given in the following list:

One second-foot equals 40 California miner's inches (law of Mar. 23, 1901).

One second-foot equals 38.4 Colorado miner's inches.

One second-foot equals 40 Arizona miner's inches.

One second-foot equals 7.48 U. S. gal. per sec.; equals 448.8 gal. per min.; equals 646,272 gal. for one day.

One second-foot equals about one acre-inch per hour.

One second-foot for one 31-day month equals 61.49 acre-feet.

One million U. S. gal. equals 3.07 acre-feet.

One California miner's inch equals 0.187 U. S. gal. per sec.

One Colorado miner's inch equals 0.195 U. S. gal. per sec.

One acre-foot equals 325,850 gal.

One cubic foot equals 7.48 gal.

One horsepower equals one second-foot falling 8.8 ft.

The formula $\frac{\text{sec.-ft.} \times \text{fall in feet}}{11} =$ net horsepower may be used to calculate water power on a waterwheel realizing 80% of the theoretical power.

The Whitmore Brake and Overwind Prevention Gear

In the accompanying illustration is shown an improved Whitmore patent brake engine and overwind prevention gear which was recently fitted on a pair of winding engines, 26x60 in., working with 90 lb. steam pressure at the Huncoat Pit, Accrington, Lancashire, England. The winding engine has a flat drum 14 ft. diameter with two cast-iron brake paths 15 ft. 3 in. diameter to which was fitted a double set of post brakes, the tension rods of the brakes being made

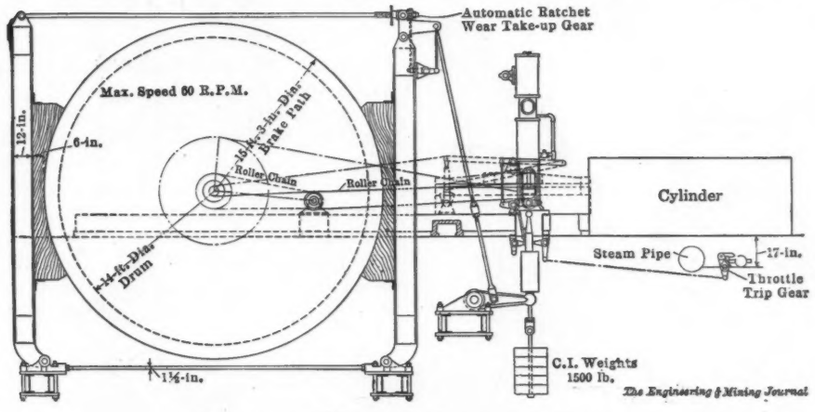


DIAGRAM OF WHITMORE BRAKE FOR HOISTS

of forged steel with all screws cut on swelled portions, to prevent any undue strain on the threads. The brakes are fitted with the Whitmore patent arrangement for automatically taking up the wear on the blocks and ensuring that the brake engine will always exert its full pressure on the brake.

The brake engine, which is of the vertical design, is coupled to the post brakes through the medium of a spring box to prevent any undue strain or shock when quickly applied. In addition to the steam, deadweights are applied at the same time, of sufficient power to hold the engine with full load in the shaft, in the event of the main or supply pipe to the brake engine failing.

The full power of the brake with steam plus deadweights will hold the engine with all steam on the cylinders plus a heavy descending load; the object being to have a brake sufficient to cope with any emergency.

The brake engine is secured to a pair of cross-channels, fixed in the foundations and box bedplates, and which carry the overwinder as well. The overwinder, which is of the Whitmore latest C-type, consists of a parallel ball governor driven by steel roller chain off the crankshaft of the engine. Fitted to the governor column are the index screws, driven with machine-cut gears, with a double pair of nuts, and so arranged that the wheels can be altered for varying lengths of rope, without any keys requiring to be withdrawn. This is a special feature, and useful for engines required for sinking purposes where the length of rope is constantly changing.

The action of the Whitmore gear is as follows:—Directly the engine overspeeds in the middle of the wind, the speeding hooks engage the wing nuts, and gradually apply the brake, through the brake engine, stopping the engine slowly, but with an increasing brake power, as the brake becomes fully applied. Before the brake engine is applied, however, the throttle valve is closed by tripping the connection between the driver's throttle valve-handle and the actual valve. This mechanism is similar to the ordinary escapement motion of the corliss engine valve-gear, the valve being closed by a deadweight and lever. In actual practice this valve is closed before any strain is set up in the crankshaft from the brake being applied, but in case the throttle valve fails to close, there is still allowed enough power in the brake to stop the engine with all steam on the pistons.

As the cage approaches the surface in ordinary winding, there is fitted on the Whitmore gear what is termed the third attachment, that trips a spring, if the drum is traveling at too fast a "crawl" speed in the last two turns of the drum, and suddenly applies the brake. This portion of the gear comes into action in case the driver suddenly gives the engine steam again, say three or four turns of the drum from the top, and so would be coming to the surface too fast. Also this is the safeguard to prevent the bottom cage, when men are being lowered, from getting a severe bump on the bottom bearers.

For the prevention of overwinding, or starting the cage in the wrong direction, a second pair of nuts is provided, which give, by a rotative action, a quick tripping of a catch on the connection to the brake engine, releasing a spring, to close the throttle valve and apply the brake to its full power, suddenly.

In a number of northern mines, a practice is made, on Sundays, of allowing the cage in the downcast shaft to be lowered one to two turns of the drum from the top position, in order to get more air into the workings. Should the driver make a mistake and, instead of lowering the cage, go fast to the top, then there is fitted on the overwinder a fourth attachment, which prevents overwinding, by suddenly applying the brake before the top position. A modification of this fourth attachment serves the same purpose of preventing starting in the wrong direction, with two or three deck cages, provision being made on the gear so that if the driver purposely wishes to bring the cage to the surface, he can do so by lowering his cage first by half a turn of the drum. This arrangement does not come into action on the ordinary direct winding, but only in case of dropping the cage down, and then making the mistake of starting in the wrong direction. The overwinder is entirely an emergency controller, and on coming into action can be wholly re-set by one man with one spanner.

At the Huncoat pit there has been fitted to the overwinder a contrivance termed the "differential speed gear for men and coal-winding," by means of which, when men are being lowered, the driver, by setting his lever on the platform to "Men" position, limits the maximum speed of the engine to 30 r.p.m., instead of the normal speed of 60 r.p.m. maximum for coal-winding. This renders the over-winder more sensitive in all its actions.

In order to save the unkeying of wheels, on pits that lower timber at night or raise water, a slip plate is fitted to the chain-driving wheel on the overwinder, to allow the extra motion for lifting the cage higher, every afternoon, without uncoupling the overwinder.

Sand for Hot Bearings

During the last few months a series of articles has been published in *Power* in which the use of sand for hot bearings has been widely discussed by various readers. The correction of overheating in bearings by the use of abrasives is not, according to the general consensus, commendable. This may in part

have been due to a misconception of what was meant by the term sand.

The idea, as originally suggested, was to remove the "high spots" on the journal by adding some fine, soft abrasive, such as Sapolio or Bon Ami, to the boxes while the shaft was turning at a comparatively low speed. The continued use of such an abrasive, it was argued, would grind the journal and its bearing down to a smooth even surface. Then all the abrasive was to be removed absolutely and the usual lubricants supplied to the bearing before resuming normal shaft speed.

Many machinists and engineers argued against the use of "sand," believing that a sharp, coarse abrasive was meant by that term. The use of any gritty or coarse sand would naturally scratch and wear both boxes and journals irregularly and increase the tendency toward heating.

Sharp gritty material will become imbedded in the bearing metal and become a constant cause of heating. Brick-dust, Sapolio and such fine, soft abrasives, are frequently used, especially upon large shafts. Properly used they may accomplish the desired object, but, in the hands of those who do not understand what they are doing, such a cure is apt to prove worse than the disease.

Hanging Electrical Turbine Sinking Pump*

By Cyril Brackenbury

In unwatering the old Tresavean mine in Cornwall, through the Harvey shaft, the electrically driven turbine sinking pumps were supported in the manner herein described.

In one of four other mines where high-lift turbine pumps were used for unwatering purposes, the pump was suspended by a four-fold rope system and in the other three cases by a two-fold rope system. The four-fold system required two pulleys on each pump and two pulleys for each pump on the headframe; the two-fold system required only one pulley on each pump and one pulley for each pump on the headframe. At the Tresavean mine it was decided to use a single-fall larger rope attached to a pair of triangular plates carrying a two-fold rope sling passing around the pulley wheel of the pump. The single fall of larger rope, although double the strength, has, of course, only to be half the length of a two-fold rope and, consequently, there is only half the length to be looked after and greased. The short sling, which is of just sufficient length to clear comfortably the bend of the delivery pipe, makes a convenient way of supporting the pump frame without straining it.

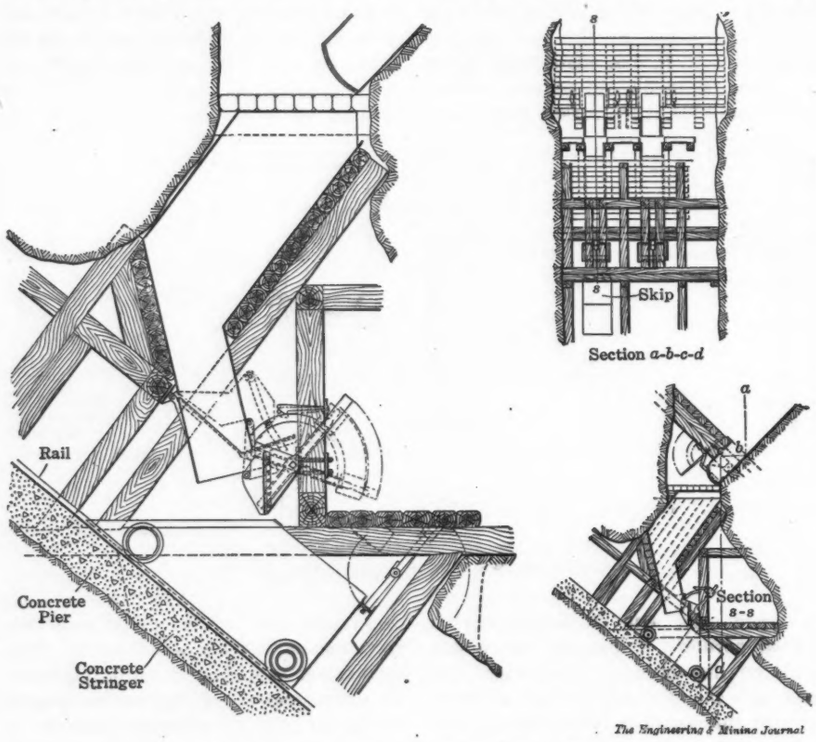
In the case of the Tresavean mine, taking into consideration the comparatively great depth the water would have to be lowered, it was decided to support the rising main along the walls of the shaft, connecting the bottom of it by means of a short reverse bend with the top of the pump delivery, a telescopic expansion joint being inserted above the top of the pump delivery and just below the bend to the rising main. It was further decided that the pump should always be supported by chains, as well as by the rope, except when it was actually being lowered or raised in the shaft. In order that the weight of the pump could be taken up quickly and conveniently, two adjustable stretching screws were made for each pump, and short length ¾-in. chains were made in lengths of 25 and 9 ft., each chain having a large hook at one end and a large link at the other. The 9-ft. lengths were made with special large links, set about the same distance apart as the adjusting links of each stretching screw.

This arrangement, together with two large S-shaped hooks, about half the length of the screw, made it possible conveniently to tighten up the chain supporting the pumps for any position of the pumps. The upper ends of the chains were slung around temporary horizontal timbers securely supported in the shaft, and the pumps could be suspended 200 ft. or so below these supports on a series of chains hooked together, the special 9-ft. length only being used at the bottom. Each tightening screw was shackled to the eye at the top of each of two steel plates, which were securely bolted to the two channel irons of the pump frame. Two sets of chains were attached to each pump, and these were sufficiently strong to carry the full weight of the pump and water column of the rising main, but the chains were never tightened so as to take the full weight, only sufficiently so to take the greatest strain off the supporting rope. Each time the pump was lowered it only took a few minutes to hang the new chains and tighten them up to the proper position.

*Excerpt from an article entitled "Unwatering Tresavean Mine," Bull. 88, I. M. M.

Measuring Pocket for an Inclined Shaft

The North Kearsarge shaft No. 4 is sunk in the foot wall of the lode, and the ore is trammed to loading bins at the shaft that serve two levels. These bins are covered with a grating of crossed rails so that boulders must be broken to 18 in. to go into the bins. On the skip chutes proper a counterbalanced arc gate that closes from below through a system of toggle levers is used, as shown in the accompanying drawing.



Skip-Loading Device at Osceola Mine

On the measuring pocket, doors of unique design are used. The lower one opens and closes the upper gate so they might be described as being of the clam-shell type. Owing to the shape of the levers by which the two gates are suspended the bottom gate moves up less rapidly than the top gate and there-

fore always closes after and over the other. This is shown in the accompanying drawing which shows the gates open in full lines and closed in dotted lines. On each side on the lower gate is a semicircular arm in the top of which is a notch. Two hooks, connected by a bar and seated on the posts that brace the bottom of the measuring pocket, drop into these notches and latch the gates in position when they are closed.

By means of a lever these hooks are raised, then the weight of the ore forces the back door backward and the front door forward, giving the ore a free passage down to the skip. Extending from the front gate are the arms carrying the counterweights, one on each side. These are adjusted so that a slight lift is necessary on the lever arm of the gates to close them, but the adjustment is so close that the jar of the skip gate as the skip leaves the bin will close the doors.

Dipper Trips for Steam Shovel

An investigation is being made at Panama[1] to determine the relative efficiency of two steam-shovel trips, operated by steam, known as the Geddes and Wichman trips. These are the culmination of a development in the improvement of dipper-tripping devices that began soon after the first steam shovel was set to work in Culebra cut.

When the dipper is loaded, the spoil within bears down upon the door and tends to hold it firmly in place, so that the force required to open the latch is often considerable. When the shovels

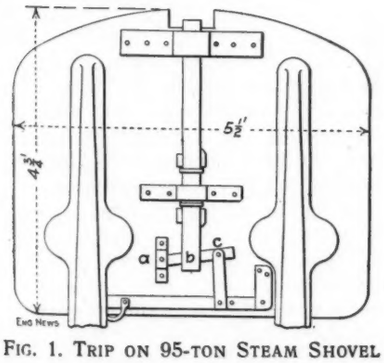


FIG. 1. TRIP ON 95-TON STEAM SHOVEL

arrived on the Isthmus, they were equipped with a single-lever latch operated by a 1¼-in. rope in the hand of the craneman, attached at its other end to the dipper trip. Several jerks were often necessary to open the latch, and almost invariably a great effort was required.

The first improvement was to compound the lever system of this original trip, as shown in Fig. 1. The original arrangement was the simple lever with the fulcrum at *a*, the weight at *b* and the power at *c*. Among improvements upon the compound-lever device, one that was given a trial in 1909, was the spring trip shown in Fig. 3. It consisted of a lever and a bar passing through a slot *e* in the latch, with a spring attached at its outer end, the power for unlatching being supplied by the spring. The door was closed by its own weight when in the digging position, placing a tension of 1300 lb. upon the spring. This device worked satisfactorily, but the toggle joint required constant renewing and some difficulty was experienced in obtaining springs of suitable strength, so that the appliance was finally abandoned.

[1]Abstract of an article in the Canal Record of Nov. 8, 1911.

The first steam-power trip was a device placed upon his shovel by Thomas Custy, a steam-shovel engineer, in 1908, but after a few months' trial this was discarded. This device was improved upon by A. H. Geddes, also a steam-shovel engineer, until it become practicable, and a patent has been granted to him. The Geddes trip was described in the JOURNAL of June 24, 1911. In this device a steam cylinder is situated on the dipper trip near the dipper. The

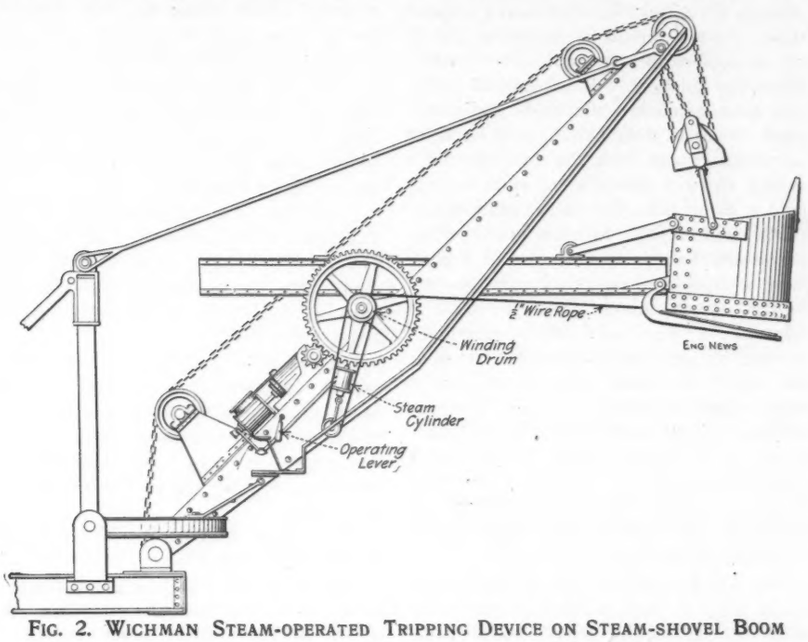


FIG. 2. WICHMAN STEAM-OPERATED TRIPPING DEVICE ON STEAM-SHOVEL BOOM

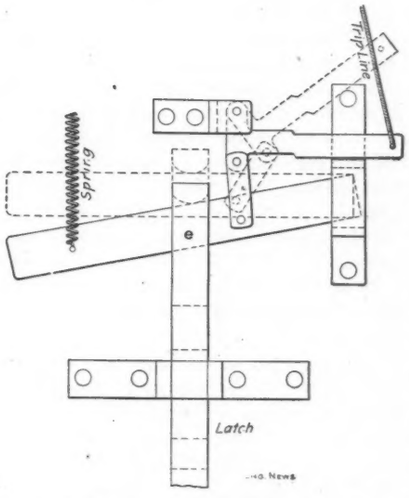


FIG. 3. SPRING LATCH TRIP ON STEAM-SHOVEL DIPPER DOOR

cylinder's piston is connected with the dipper latch through a chain and a series levers, and when steam is admitted to the cylinder the rest of the system operates the levers and unlatches the door. After a thorough trial this device was adopted, as the capacity of a shovel could be increased 100 cu.yd. per day by its use.

The latest device, that shown in Fig. 2, was invented by F. S. Wichman, of the mechanical division. The latch is opened by a pull made upon a ½-in. wire rope by the outward thrust of the piston of an air-brake cylinder. The cylinder is mounted upon the boom of the shovel and a drum is mounted upon the face of the thrusting gear on the shipper shaft, which revolves with the shaft, thus winding or unwinding the trip rope as the shipper shaft moves up or down. Thus the rope is kept taut at all times.

To give the lengthwise pull on the cable, a 6-in. diameter steam cylinder is mounted below the drum. The piston rod of this cylinder has a Y-yoke at its outer end to receive a sheave, over which the cable passes on its way to the drum. Steam admitted to the cylinder when it is desired to trip the dipper goes through a three-way cock operated by a lever at the craneman's seat. When the steam is not on, a spring in the cylinder moves the piston back into position and the tripping operation may be repeated. This device has undergone a successful test on two 95-ton steam shovels.

The Promoter

The New York *Evening Post* has been publishing some interesting characterizations of certain phases of life in Wall St. Here is one on "The Promoter."

It must be supposed that the promoter inherits his gifts. He never could acquire them. In his pursuit of capital on behalf of an opportunity he will endure hardships beyond belief; if the capital at the last moment eludes him he is undiscouraged. There is other capital, and he takes up another trail with the fortitude of a saint. He will consider no other way to gain a living than that of bringing opportunity and capital together and getting something for his trouble. It is a deal. With a deal in prospect, he may become hungry and homeless, but if you were to offer him a salary of $5000 a year to be worked for, he would decline it. He simply would not know what to do with a salary—how to spend it. He cannot understand people who work so many hours a day at a certain thing for so much money per week or month, when they might be putting through deals, one of which, if successful, would mean a lot of money all at once.

The world is full of opportunities. The world also is full of capital, but it is much harder to pry people loose from their capital than to find the opportunity. That is why the promoter's work is difficult. Nothing to him is strange. Opportunity is varied. It may be an airship model, a pneumatic horse collar, a rotary engine, a chain of retail stores, a magazine scheme, an invention in refrigeration, or anything which by effort of the imagination may be thought to fill a prospective want. But of all the opportunities, the most manageable are those to be found in mines—gold mines, silver mines, copper mines, zinc and lead mines, coal mines, or other kinds.

One who knows a promoter very well will be apt to acquire a queer notion of what a mine is. The average man's notion is that a mine is so much ground, out of which minerals may be got by digging; but to a promoter a mine is something very different. It begins with an option, develops into a contract, takes the form of beautifully engraved certificates, and ends with his own profit—or else in failure. A mining promoter will have in his pocket any kind of mine you happen to think of. Do you speak of copper?

"Copper?" he says, and looks at you with interest. "Why, I've got a mine that will break the corner they are trying to run in copper metal. It's the best thing I ever heard of."

"Where is it?"

"Right here," he answers, and he produces it forthwith from the breast pocket. "There's the blueprint. I'm going to stick to copper. There's a saying, you know—to lose money get a gold mine, to make a little money try a silver mine, but to get rich take a copper mine."

"The last time I saw you," if you have the bad grace to say it, "the only kind of mine you had any use for was a silver mine in Cobalt?"

"Yes, I did try silver mining," says the promoter, "but it played out. I'll give you a silver mine if you want it."

"Give it to me?" you say.

"Yep, I'll give it to you. I've got it with me. I haven't any use for it. I believe it's a good mine, though."

"But what do you mean when you say you will give it to me?"

"Just that. I'll sign it over to you with a scratch of the pen, all for nothing. There's $50,000 due on it the first of the month, and the balance of $100,000 sixty days later. I think it can be opened for about $250,000."

You refuse it, and he restores it to his pocket. Perhaps you do not see him again for several months, and then one morning, after you have read in the newspapers of a wonderful gold discovery in a place called Porcupine, you meet him.

"What have you done with your copper mine?" you ask.

"I'm working on it," he says, but it is evident from his lack of enthusiasm that he has already "worked upon" it much in vain, and is about to abandon that opportunity for another.

"What's this I hear about a new gold strike in a place called Porcupine?"

His face lights up. You have touched a match to the excelsior of optimism.

"That," says the promoter," is going to be the greatest gold camp in the world. Old miners won't believe it. It's too good."

"Well, tell me something about it," you suggest.

"I've got one of the best mines up there," the promoter announces. "It is right next to——"

"But this place has only been discovered. Everybody is waiting for the winter to break up in order to get to it."

"That's all right," says the promoter. "I've got one of the choicest mines in the whole district."

"Have you been there?"

"No."

"Well, don't you mean you have merely an option on a claim that you never saw?"

"How else do you get a mine?" says the promoter, and is offended until you show a more wholesome interest. Then in ten minutes you learn more about the geology of this particular Porcupine and of all other great mining camps than you ever could get from books; also the information that in a few months the public will be gold mad again, and that the man who gets a company started first and places his stock on the market will reap his reward. All that he needs is a man with $60,000 to pay down on the option; what he has is an option to buy the option on a particular claim. After the option itself has been bought for $60,000, there will be one hundred and twenty days in which to find $240,000 more to buy the claim. The price of the claim is $300,000, but the $60,000 option money will apply on the cost. Then $2000 more will incorporate a company and print the stock, and nothing can stop the promoter from getting rich after that. He will take a certain quantity of stock for himself. What will become of the claim after the company has been incorporated and two or three million dollars' worth of stock sold, will be governed by the honesty of people with whom the promoter will be through so soon as he has got his own stock and sold it for his profit. He may be a copper miner after that, or a man on the verge of madness over a newfangled explosive which a little chemist in an East Side tenement has discovered, and which will make war so bloody that it will have to be stopped.

If you have not $60,000 with which to buy the Porcupine option, perhaps you can lend him $5 until three o'clock.

Arizona Copper Co.

The report of the Arizona Copper Co. for the year ended Sept. 30, 1911, shows a total production of bessemer copper of 34,569,019 lb. as compared with 32,161,205 lb. for the previous year. This is the largest output since the company began operation. The total ores mined from the company's properties during the year amounted to 744,746 dry tons, which indicates a yield of 46.4 lb. of copper per ton of ore. Of the total ores mined, 94% were concentrated, the remaining 6% being direct-smelting ores, the latter figure including pyrites for the acid plant and siliceous ores for converter lining. Of the total copper produced, 82% came from sulphide and 18% from oxide ores.

The mines making the largest production were: the Humboldt, producing 281,417 tons, of which 263,901 tons were concentrating ores, 8673 tons direct smelting, and 8784 tons siliceous ores for converter lining; the Coronado mine, which produced 142,571 tons of sulphide ores, of which all except 20 tons was concentrated; and the Metcalf mine, which produced 102,666 tons of oxide concentrating ores from surface and underground workings.

In the Longfellow group of mines the caving system has been still further extended during the year under review. In the year ended September 30, 1910, 51.2% of ore was taken out by the old method of timbering and back filling. During the year ended Sept. 30, 1911, this proportion has been reduced to 33.9%. The electrification of the second level of the Humboldt mine has been completed.

Motors hauling about 50-ton trains have replaced the mule.

Reduction Works

During the year 582,335 dry tons of sulphide concentrating ores were treated, of which 319,130 tons were treated at No. 6 (Morenci) concentrator and 263,205 at the Clifton concentrator. The average ratio of concentration was 5.6: 1. No. 6 concentrator was enlarged from 900 to 1500 tons per day capacity, although the work was not sufficiently far advanced to affect the results for the year. The ores are now delivered through the new No. 6 shaft to crushed-ore bins of 1000 tons capacity, from which the ore is automatically fed to a conveyor belt and the coarse smelting ore is picked out by hand. This belt then delivers it to a grizzly with bars placed 2 in. apart, the oversize going to a crusher which reduces it to 2 in. This ore passes through revolving trommels with manganese-steel jackets perforated with ¾-in. round holes. The oversize is delivered on a wide slow-traveling conveyor belt on which a further sorting of smelting ores can be done. It then passes under powerful magnets by which any pieces of steel or iron are removed and the ore drops to heavy crushing rolls set to crush to ½ in. The product of these rolls, together with the fines separated by the trommels, now drop to a third conveyor belt, which delivers it into the fine-ore storage bin of 2000 tons capacity.

From the fine-ore bin the feed for the mill is drawn by automatic feeders and delivered to conveyor belts and passed over automatic continuous self-registering weighers and delivered to the first set of Hancock jigs. These deliver their concentrates directly in the bin on an electric hauling track on the surface. The tailings from these jigs pass into the original No. 6 mill where the first wet crushing is done by rolls and the crushings are elevated to No. 2 jigs in their old position. The tailings from these are further ground in Huntington mills and treated on concentrating tables and vanners, as before—the fine concentrating machines having been increased in capacity by the addition of the old vanners from concentrator No. 5.

During the year the oxide concentrator treated 104,764 dry tons of ore, the tailings from which, amounting to 90,526 dry tons, were treated in the leaching plant. From these ores 11½% of the total copper production was obtained. The sulphuric-acid plant supplied the leacher with 3779 tons of acid. The total ores and concentrates smelted during the year amounted to 150,991 tons, with fluxes and byproducts resmelted the amount was 230,833 tons. The average yield of copper from ores and concentrates was 11.22 per cent.

The proposed new works of the Arizona Copper Co., which includes the remodeling both of the concentrating and the smelting plants has already been discussed at length (Eng. and Min. Journ., Dec. 16, 1911) as well as the financing by which this reconstruction will be carried out.

Chino Copper Co.

The first quarterly report of the Chino Copper Co., covering the fourth quarter of 1911, shows that at the close of development in the latter part of September, 466 drill holes had been completed to an average depth of 386 ft., the total footage drilled being 179,871. Of these, 386 holes encountered ore, the average thickness of which was 107 ft. Drilling for ore development was discontinued because the principal orebody was sufficiently well defined to permit of comprehensive plans for mining and, so it is stated, because enough ore had been opened to provide for the full capacity of the mill for over 30 years. Development of other known orebodies will be deferred. Drilling was done in 200-ft. squares except where physical characteristics necessitated closer spacing.

Nearly 55,000,000 Tons Developed

The total quantity of ore developed to Oct. 1, 1911, was 54,970,646 tons, having an estimated average grade of 2.24%. Of this, over 32,000,000 tons lie above the level to which steam-shovel mining will be carried. Westward extensions of the orebodies have been indicated by "scout" drilling and it is stated that the tonnage of these additional areas is large. The limits of the orebodies have been well defined north, east and south.

Some dump cars and another locomotive have been added to the equipment; another steam shovel and two more locomotives are in process of delivery and these will bring the total to six shovels and 11 locomotives. Railroad yards and connections with the Santa Fé R.R. were in operation before Jan. 1. All the permanent trackage necessary for mining operations has been completed and the total length of the company's tracks is now about 10½ miles.

Stripping and Mining

Up to Jan. 1, 1,938,000 cu.yd. of material had been moved by steam shovels; of this, 377,000 tons were ore and were stockpiled. The average cost of this stripping and mining is given at about 31c. per cu.yd. An increased water supply for all purposes has been developed and equipped. The Romero, Whim Hill and Chino sections of the mine are now available for steam-shovel work and the Hearst section should be ready in April. At the Hearst section shipments will start on clean ore; a large amount of carbonates will continue to come from the upper levels of the other sections for a few months.

Concentrator

The first section of the concentrator was placed in operation about Oct. 15 but did not run regularly until Nov. 1. The second section was completed in December and placed in commission about Jan. 1. The third section should start before Mar. 1. Excavating for the two additional sections, making a total of five, started in October; steelwork for the addition to the main building is now well underway and most of the necessary machinery is on the ground. One of these sections is expected to go into commission in May and the other about July 1, when the total capacity of the plant will be 5000 tons per day. The power plant designed originally for three sections has been found ample for five. The volume of water available has been found to be as great as expected.

During November and December the first section treated about 700 tons per day. As this ore contained a large quantity of oxidized copper, the mill extractions have been low. The grade of ores treated is said to have been above the average, and the results in terms of pounds of copper are claimed, therefore, to be nearly as high as would be the case in securing high recoveries from a normal grade of ore.

During December the recovery amounted to 30 lb. of copper per ton and the cost of production inclusive of everything, is given as less than 8.3c. per lb. Two sections since Jan. 1 have been treating approximately 800 tons each per day. The rate of tonnage per section is being increased, but some delay has been experienced in securing railroad equipment for hauling ore to the mill. It is stated also that because of the carbonate character of the ore, milling is difficult and it would be impracticable to operate at full capacity on this grade and character of ore as it would result in decreased recovery. It is claimed, however, to have been demonstrated that the sections of the mill as at present constructed and in operation are capable of handling a minimum of 1000 tons each per day of ores of normal grade and character. It is estimated by Messrs. MacNeil and Jackling that the January costs will not exceed 8¼c. per lb., in which event the profits from the operation of two sections for the month will amount to over $60,000, or approximately $1.40 per share. No difficulty has been experienced in the operation of the mill and no alterations of consequence have been necessary.

According to Paul Speier, the production of cadmium in Upper Silesia in 1911 was 42,000 kg. The market opened at 600 marks per 100 kg. and in response to a good demand rose gradually to 700 marks.

A Large Rock Crushing Plant

A plant, situated near the Kensico dam site in Westchester County, New York, will be built solely to crush rock for the concrete work on the dam. The crushing equipment includes two Blake-type crushers, the initial one with a 5x7-ft. clear opening, and a set of 30x60-in. rolls with lateral adjustment. The estimated maximum capacity of the plant will be 500 cu.yd. per hour.

For the construction of the Kensico dam, in Westchester County, New York, to create a storage reservoir in connection with the new Catskill water supply for the City of New York, the contractor, H. S. Kerbaugh, will install a very large crushing plant, designed by the Traylor Engineering & Manufacturing Co., of 30 Church St., New York.

The plant will have one of the largest Blake-type crushers ever built. The unusual size of the crushing units makes a description of the plant of interest. It is situated at Valhalla, in the suburbs of White Plains, on the New York Central railroad, 30 miles from New York, and is described by Samuel W. Traylor in an article in *Engineering News* for Feb. 22, 1912, from which the following account is abstracted.

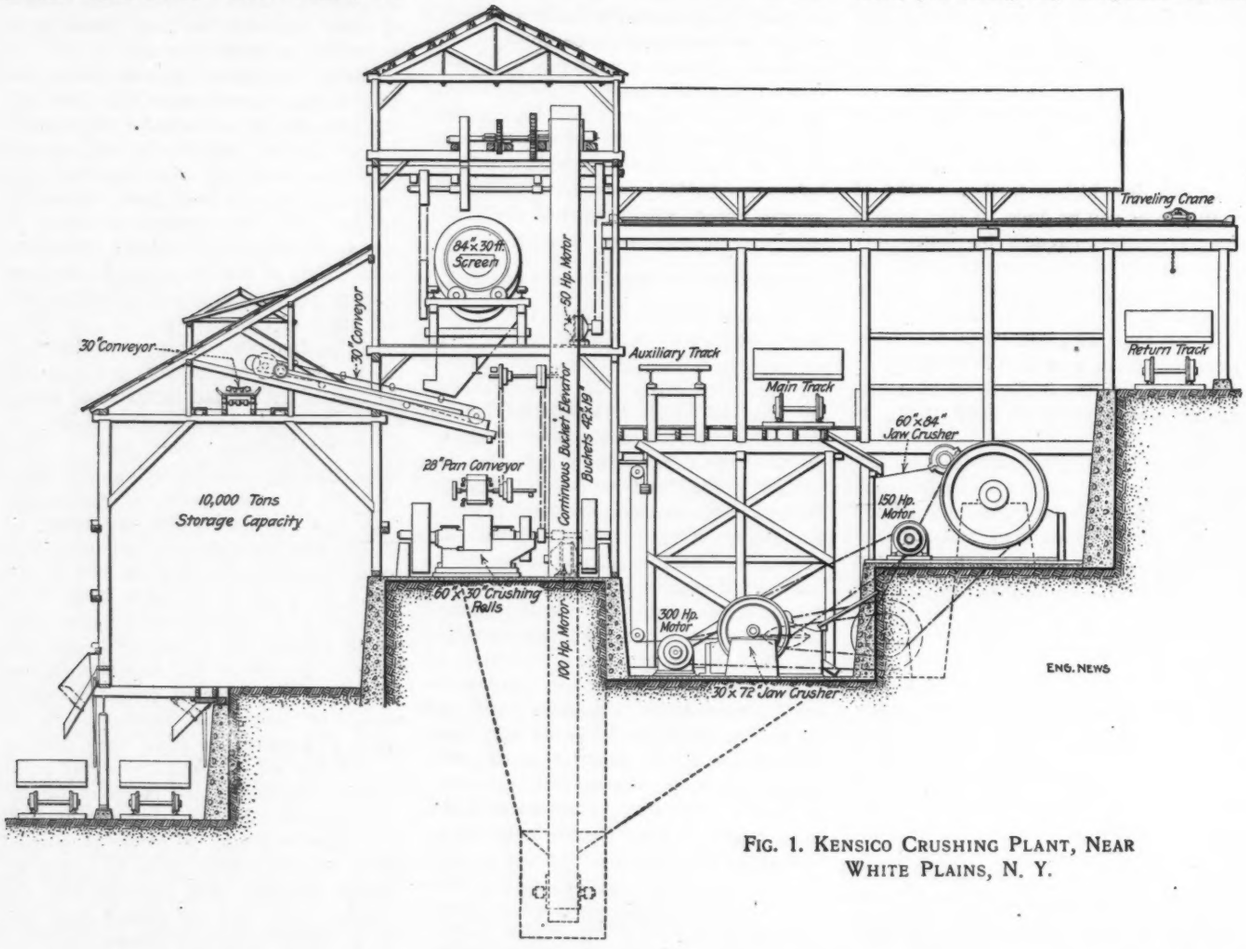


FIG. 1. KENSICO CRUSHING PLANT, NEAR WHITE PLAINS, N. Y.

CRUSHING PLANT

The layout of the crushing plant is shown in Fig. 1. The progress of the rock through it will be as follows: Quarry rock is brought in on the high-level tracks and is dumped into the initial 5x7-ft. crusher, which reduces the rock to a size of 9 in. and finer. It then passes over a grizzly with 4½-in. openings, the undersize or through product going directly to the elevator, while the oversize is run through the second crusher with an opening 3x6 ft., reducing it to 4 in. and finer. This product, with the undersize from the grizzly, then goes to the elevator and is raised to a 7x30-ft. screen. This screen is so designed that all material ¼ in. and finer is removed for a sand product and stored separately, while the coarse aggregate, or stone between ¼ and 2½ in., is distributed by a 30-in. conveyor into a 10,000-ton storage bin, located at the lower end of the plant directly over the outgoing railway tracks. The oversize from the screen goes to a small bin, which is equipped with a 28-in. steel-pan feeder and is delivered uniformly to a heavy-duty 30x60-in. crushing roll; the product from this roll being returned to the same elevator and screen.

The storage bins will be so constructed with bottom- and side-discharge gates as to permit of loading standard-gage cars running under the bins as well as at the sides, preventing any congestion at this point and making available the full storage capacity of the bins by reason of the many points from which the product is discharged.

From this brief description the simplicity of design and economy in operation will be noted, as well as the small number of individual machines required for so large a capacity. The equipment of the crushing plant is as follows: One jaw crusher, with a clear opening of 5x7 ft.; one jaw crusher, with an opening of 3x6 ft.; one continuous bucket elevator, with buckets 42 in. wide by 18 in. deep

by 19 in. projection; one all-steel 7x30-ft. revolving screen; one 30x60-in. heavy-duty crushing-roll.

There is a special unloading device supported by the crane extending over the large crusher, delivery tracks and chutes. This device consists of an air lift, the cylinder being 20 in. in diameter, to work under an air pressure of 80 lb., and having a lifting capacity of 10 tons. As the cars pass in front of the chutes, one man can quickly dump them by hoisting one side of the car, making a very economical arrangement.

The initial crusher, as designed, will take any piece of rock that will ordinarily come from the quarry, and this greatly reduces the cost of quarrying, handling and crushing.

The matter of repairs is of small moment in this plant, as it is estimated that all wearing parts will last for two years or more in continuous operation without renewals.

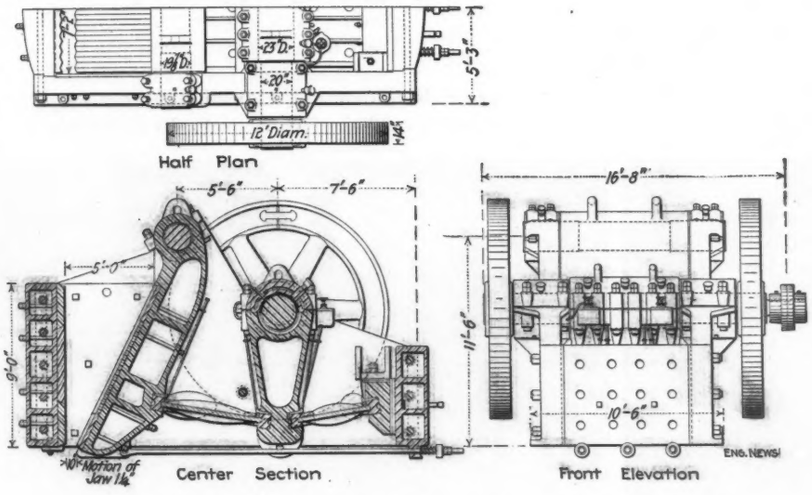


FIG. 2. THE 60x84-IN. BREAKER FOR THE KENSICO CRUSHING PLANT

THE LARGE BREAKER

The large or initial crusher being built for this plant has a jaw opening of 5x7 ft., and will easily take a stone weighing 10 tons and reduce it within 1 min. This crusher is constructed of cast steel throughout, with the exception of the large flywheels, and has a total weight of 450,000 lb. The flywheels are 12 ft. in diameter and weigh 15 tons each. The swing-jaw shaft is 20 in. in diameter and weighs 6 tons, while the pitman shaft is 24 in. in diameter in the pitman and 20 in. in the bearings, and weighs 8½ tons. The swinging jaw of this machine is 13 ft. in length by 7 ft. wide, and weighs 74,000 lb. The wearing plates are made entirely of manganese steel in sections which are interchangeable, so that the different sections may be changed about from time to time, thereby greatly increasing their life.

All bearings are water-cooled, and compression grease cups 12 in. in diameter are provided as an integral part of such bearings for lubrication.

The overall length of the crusher is 24 ft., the width 15 ft., and the height 13 ft. A better idea of the construction of this machine may be obtained by referring to a sectional view, Fig. 2.

The second crusher has an opening of 3x6 ft. and is of the same type as the large one, with an over-all length of 13 ft., width 13 ft., and height 9 ft. The swing-jaw shaft is 12 in. in diameter, and the pitman shaft 14 in. in the pitman and 12 in. in the bearings. The flywheels are 8 ft. in diameter by 12 in. face, and have a peripheral speed of 5000 ft. per min., being operated at a speed of 200 r.p.m. The total weight of this machine is 210,000 lb.

The 30x60-in. heavy-duty roll will be one of the largest smooth-faced rolls yet built in this country, considering the width of face and weight of machine. This roll has an overall dimension of 16 ft. The shafts are 16 in. in the hub and 14 in. in the bearings, each bearing having a length of 46 in. The frame is cast in one piece, and alone weighs 30 tons. The drive pulleys are made of cast steel, the main pulley being 96 in. diameter by 24 in. face, while the smaller pulley on the movable roll is 60 in. diameter by 14 in. face. This roll is operated at a speed of 50 r.p.m., or a peripheral speed of 785 ft. per min.

The rolls are equipped with an ingenious lateral adjusting device that prevents corrugating or channeling of the roll tires. The bearing of this roll is so constructed that it is double the size required for the work being done, is positively dust proof and efficiently lubricated. Its capacity is 300 cu.yd. per hr., crushing from 4 in. down to 2 in.

The large crusher is operated by a 300-hp., 3-bearing, form "M," mill-type induction motor, of the slip-ring type, and has about 2½ times full-torque load in starting. It operates at a speed of 560 r.p.m. This motor is equipped with a self-starting regulator, 33x27-in. pulley, and drives a jack shaft with a 26-in. triple leather, endless belt, the pulley on this shaft being 94x27 in. This jack shaft is equipped with an approved individual friction cut-off clutch which permits the starting of the crusher after the motor is in motion. On this jack shaft is a 60-in. heavy sheave wheel, with 15 grooves for 1½-in. rope, by which the large crusher is operated, the driving sheave on the crusher shaft being 11 ft. in diameter. A suitable tension carriage and idler sheave is installed in connection with this rope drive.

It will be noted that on account of the intermittent load, due to the irregularity in the size of product fed into a crusher of this size, it becomes necessary to have great flexibility in the transmission, although it is apparent that when this crusher is operating at full speed, with the enormous momentum of the two 12-ft. 15-ton flywheels revolving at a peripheral speed of 3400 ft. per min., there can be but little variation.

The motor for operating the 3x6-ft. crusher is 150 hp., 560 r.p.m., and of the same type as the 300 hp. motor above mentioned. It is equipped with self-starting regulator, and a pulley 29x21 in. is belted direct to the crusher, with a 20-in. extra double leather, endless belt.

The crushing rolls are operated by a 100-hp., 560-r.p.m. motor, of the same type as the others, and equipped with a pulley 21x17 in., which drives a 108x17-in. pulley on a jack shaft, this jack shaft operating the rolls and also the countershaft that drives the roll feeder.

The elevator and screen are driven by a separate 50-hp. type "K" squirrel-cage induction motor, equipped with self-starting regulator, and operates at a speed of 850 r.p.m.

There are two conveyors in the plant—one, the short or cross conveyor, is operated by an individual 5-hp. type "K" motor, direct-connected through gearing and countershaft; the other, or main conveyor, is driven by a 15-hp. type "K" motor, direct-connected through gearing and operating at a speed of 850 r.p.m., and provided with an automatic starter.

The entire plant will be electrically operated by power transmitted from New York, with current of the A. C. form, 3-phase, 60-cycle, 440 volts, stepped down from 2200 volts.

The Alaska-Treadwell Gold Mining Co. has increased its dividend to 75c. quarterly. The current dividend, payable on Feb. 28, amounts to $150,000. This is the largest quarterly declaration since 1910, when the dividends aggregated $3.25 for the year.

The Treatment of Metallic Junk

By Donald M. Liddell*

A general review of the junk-smelting industry. Small plants keep alive by close supervision and small economies. Their product, as a rule, is of good quality.

*Associate editor, Engineering and Mining Journal.

Statistics of the recovery of metals from scrap and junk are conflicting and confusing unless they be carefully defined. Most users of copper and lead have scrap and trimmings, which they remelt or return to the refiners for resmelting. Manifestly such metal should be excluded from statistics because it has never been used. The correct view of the secondary recovery of metals is, in my opinion, confined to what is obtained from the reworking of old material, i.e., material that has been used, collected, and restored to the market in the form of ingot, etc., thus becoming to all intents and purposes new material, with which it is in fact competitive. Such recovery is practiced not only by smelters who make it their special business, but also by the refiners whose chief business is the treatment of virgin copper and other metallic ores.

Consequently it is with this caution that the following figures[1] are quoted for the recovery of old metal in 1910:

TILTING FURNACE FOR SCRAP

OIL FIRED COPPER REVERBERATORY

Copper, including alloys other than brass, 51,000 tons; brass, 62,000; lead (as such) 29,384; lead in alloys, 25,939; spelter, 41,223; zinc, in other alloys than brass, 6686; bar antimony, 9; antimony in alloys, 2,770 tons. The recovery of copper on this basis would be equal to about 17% of the domestic consumption of new copper; of lead to 11.5%; and zinc, 23.2%. The total value of the scrap metal recovered was $45,525,000.

The Junk Business Probably Growing

While prophecy is an unsafe field, it seems probable that in coming years the importance of the secondary-copper and tin industries will undergo marked increase: copper, owing to the fact that the great use of this metal, owing to the expansion of the electric trade, is comparatively recent, and replacement has not begun in many cases. Tin should show a great increase owing to recovery of tin from old cans, an art which is still in a backward state[2], but of which the ultimate success cannot be doubted.

Copper Mainly Treated at Big Refineries

In general, the recovery of copper is chiefly confined to the large refineries. This is in great measure due to the amount of capital necessary to carry the large stocks of metal necessary to this industry; the objections to blast furnaces in cities; and the fact that much of the product must be treated by the electrolytic refiner even after recovery. For instance, a typical analysis of material from one secondary smelter was; Cu, 98.38%; Ag, 10.5 oz.p.t.; Au, 0.14 oz.p.t.; Pb, 0.425%; Sn, 0.102; As, 0.045; Sb, 0.117; Ni, 0.132; Fe, 0.044%; Zn, none (!); total accounted for, 99.381%. From another smeltery the pig carried only 95% of copper.

A typical city collecting plant operates as follows. The lead-dross furnaces are used during the cooling-down stage to burn off insulated copper wire. The cleaned wire, if light, is "cabbaged" and sold. If heavy, is baled and sold. There is a large press for heavy scrap. Brass scrap is either baled or barreled for use by brass founders, or made into ingots and sold. Dross from the ingot making is treated and retreated until all available copper is extracted, the drossed zinc being volatilized. Some losses in copper melting are interesting.[3] With heavy bare copper wire, the melting loss in 9054 lb. melted was 1.83%; with fine wire, including loss due to adhering insulation, 10.54%; while with yellow brass punched scrap, the shrinkage was 3.5%.

The metallurgy of copper at the large refineries is usually comparatively simple; if the material is high-grade it is put in with the refined-copper charge; if low-grade, it is put through the blast-furnace, and thence goes to the anode furnace. An interesting point in this connection is that charges of pure clean scrap wire give higher-conductivity bars than do most cathode charges. Only one plant seen had a concentrating table in use. The metallurgy here was somewhat complex. Low-grade material containing copper in metallic form was put over the concentrating table, and the concentrate sent either to blast-furnace or reverberatory, according to grade. Low-grade material containing nonmetallic copper was sent to the blast furnace, after briquetting, if necessary, and the blast furnace product sent to a reverberatory. There the charge was given a rough refining and cast. The bars were then recharged into another reverberatory and given a final refining, and cast as casting ingots. The reverberatory slags of course went back to the blast furnace. The use of wet concentration has by no means the vogue it apparently should, and as a rule, both in small and large plants, dust-chamber capacity is far under what it should be.

Briquetting in the scrap plants is a somewhat easier matter than around ore smelteries, as the threads in buffings and

[1]Press Bulletin, U. S. Geol. Survey, Aug. 21, 1910.

[2]Eng. and Min. Journ., Dec. 30, 1911.

[3]E. A. Barnes. Before American Foundrymen's Association.

sweepings acts as does hair in mortar. Lime is usually added as a binder and the Chisholm-Boyd-White press seems to be favored.

Copper Industry not Integrated Like Iron

Probably most of the so called secondary-copper recovery is not really such. In the iron business the integration is complete, and the same firm often owns everything from mines to rolling mill. In the copper trade, the American Smelters Securities Co. turns out sheets at one of its plants, but no wire mill is owned by a refiner, while many wire mills do not remelt their own scrap, so that the copper refiners are constantly treating large tonnages of wire-bar scrap, i.e., copper which has never seen any actual service.

There is also a good deal of insulated wire which is simply treated by burning, the resultant mass pounded to free the wire from the burned insulation, and the clean wire cabbaged for sale to brass and copper founders. The saving of the ashes of the insulation for the lead and copper contained, is however, not always looked after as closely as it should be.

Brass scrap usually comes to the junk dealer in comparatively clean form, and much of the treatment consists only of grading the brass and melting into ingots, or else cabbaging for use in brass founding. Low-grade material usually goes through a blast furnace, but this loses the zinc. Two companies were seen using electro-magnetic separators to free brass from included iron. These turn out a superior ingot, beside making a better recovery of brass, as well as being paid for the scrap iron recovered.

The accompanying illustrations[4] show what is perhaps the present last word in scrap smelting. These are taken in the junk plant of the Westinghouse Foundry & Manufacturing Co., and represent oil-fired furnaces, and a plant in which ultimate efficiency rather than immediate capital expenditure has been considered.

Lead Treatment

The recovery of lead, owing to its ease of melting, and the number of small local users of lead and lead alloys, makes this the strong point of the scrap smelter, and it may here be said that the ingenuity of device displayed would put many a big refinery or smeltery to shame. Only two plants out of eight lead smelteries visited had a blast furnace, and one was idle. Excellent work, however, is carried on in the reverberatories. One slag examined showed 0.79% of lead. A partial analysis of the slag gave: Insoluble, 36.22%; FeO, 32.81; CaO, 13.12; S, 0.55%. This with the lead, accounts for only 83.49%.

Another slag, from a different works, gave: Pb, 0.92%; Cu, 0.22; Sb, tr; Sn, 0.41; SiO_2 (true), 41.35; Al_2O_3, 27.05; FeO, 9.24; CaO, 17.50; MgO, 3.14; total accounted for, 99.83%. When it is considered this slag is skimmed directly off a metal bath; with no regulus present, and carries what many persons would consider a prohibitive amount of alumina, the high degree of metallurgical skill of the small smelters becomes evident.

The general impression I have gained is that most of them calculate their charges with much care, both in regard to composition of resulting metal and slag, while the furnaces are built to embody many desirable features. For instance, most of those seen took the air into the firebox through passages under the furnace bottom, thus preheating the air and chilling the bottom. The bridges were either air or water cooled. The working door was usually directly under the stack opening, and the stack usually fitted both with a direct throttling damper and one to check the draught by opening the base of the stack to the outer air.

Theory might indeed, point to a little greater use of waste heat in the larger establishments, such as for waste-heat boilers, fuel economizers, heating lavatory water, or drying briquets, but in general these small plants showed their reason for being in their small economies and close supervision, and some of them had the very apparatus mentioned above.

A typical lead plant is described below in detail, except that the furnace will not be described at length, as it conformed to the general features noted above. This plant is devoted solely to the treatment of high-grade lead and tin drosses (that is, those which do not require a blast furnace for their reduction) and zinc scrap, and is about 100 ft. square.

Sampling and Buying

The drosses are bought on a fire assay, the sample for which may be either drawn at the works, or sent by the consignor as a basis for bids. As in many other scrap plants, a pound-price offer is usually made on the basis of the seller's sample and in case the work's sample checks the original closely, no further adjustment is made. After acceptance of terms the various lots are mixed together for reverberatory treatment, and it is evident that to the technical skill of this mixing is due much of the success of the plant.

The mixture of drosses goes direct to a reverberatory in charges of about 3000 lb. each, charcoal being used as a reduction agent. This reverberatory has a hearth area of about 4½x7 ft. There are no water jackets, but heavy iron plates cover the entire exposed surface, and are secured by the usual arrangement of buckstays and tie rods.

There is a short vertical flue, about 4 ft. high, leading from the furnace, and then an overhead horizontal flue, about 24-in. square inside and about 12 ft. long, after which comes a stack. There is said to be little flue dust recovered from the overhead flue. None of the other furnaces or kettles is fitted with any dust- or fume-saving device. It is questionable whether any use of the dross-reverberatory fume would be made at this plant, if recovered, as any zinc in the drosses treated is burned off and escapes via the stack.

This furnace is run day and night, turning out about six charges per day, so mixed as to be self fluxing. Tapping is through a hole kept open with a 2½ in. bar. The metal flows out into a small kettle just in front of the tap hole, of such a size as to be just large enough to hold the metal and foul slag. The clean slag then flows out and over the foul slag (which is mainly unreduced litharge) and into a sand bed, in which it solidifies and from which it is afterward taken out to the dump. The slag was of nice clean appearance, and said to assay less than 0.5 per cent of lead. The kettle rim is built up except for a space about eight inches. Through the space thus left, the slag flows off into the sand bed.

Details of the Lead-Furnace Work

The furnaceman's experience has to guide him in this work, if he sees that the metal is so great in quantity that some foul slag will overflow into the sand bed, the furnace is stopped and one or two pigs of metal ladled out of the kettle, then the furnace allowed to flow again. The charge is rabbled during its melting down, the rabble used being apparently out of all proportion to the furnace, but its use is not onerous to the furnaceman as it is hung by long chains from an overhead support, and apparently its size is of advantage in shortening the time of the rabbling operation. About 2300 lb. of metal are produced per charge, about 250 lb. foul slag, which goes back into the next charge, and about 250 lb. of clean slag.

The metal from this dross furnace is sent to a refining furnace of similar construction, the dross from which goes back to the dross furnace, and the metal to three small melting kettles of about 1½ tons capacity. Here, if necessary, tin is added, and the metal cast as solder. The great bulk of the lead is sent out in this form. Occasional casts of pure lead are made into small size pigs or bars suitable for plumbers' use. There is a five-ton kettle for this purpose, used also to fill car-load lot orders for special alloys. While antimonial lead dross is usually avoided, small quantities are occasionally taken which are worked into babbitt.

As a rule the small kettles are placed two by two in brick settings, an arrange-

[4]Courtesy of the American Machinist.

ment which cuts out radiation loss from one wall whenever two kettles can be run simultaneously. The moulds are, as a rule, water-cooled, either being elaborate with false bottoms connected through the trunnions or else simple iron moulds set in a large tank of water. A possible economy is the use of fuel oil instead of coal for firing reverberatories, in which case both oil and air should be preheated with waste heat. The desire to avoid blowing or compressing apparatus probably accounts for the preference for coal.

Zinc Treatment

A typical eastern city zinc plant treats only zinc scrap. This is simply melted in a 2500-lb. kettle, and the pure metal cast into market spelter. The skimmings are sold to other plants for final treatment. The zinc kettles are, like the lead kettles, coal fired, and usually efficiently hooded with sheet iron.

The zinc-oxide skimmings are sold either to chemical plants for the manufacture of soldering salt, or to zinc smelters for the production of spelter. Few junk smelters work up their own skimmings. The latter, when done, is more the Western practice, as zinc metallurgists and workers are more common out there. A retort furnace is used in which the retorts are cylindrical, about 4 ft. long and 9 in. in diameter, with walls 1 in. thick.

In this connection the quality of metal turned out by the scrap smelters may be taken up. There is, in general, a prejudice against the output of the junk men, which is, to a large degree, without foundation as far as lead and spelter are concerned. I have seen the junk smelter's scrap-lead extruded into pipe of first-class quality without difficulty while much of their spelter is a higher quality than first-hand goods. The reason for this is obvious.

When scrap zinc alone is melted down, the impurities remain in the skimmings, and even in the treatment of the scrap melters' residues, the distiller works on a comparatively pure material, the result being a spelter that is much like the redistilled grades so highly recommended. What can be done with absolutely clean copper wire scrap has been noted, although for the general run of low grade material it is cheaper to use a blast furnace and turn out a pig needing electrolytic refining, rather than to attempt sorting into grades.

Two plants once attempted to make complete recovery of zinc-bearing flue dust from brass smelting, a bag house being used for this purpose. This flue dust was subsequently leached with sulphuric acid, with intent to make lithopone. The process was unsuccessful, the resulting pigment being of poor color, but it is by no means certain that the solutions could not be purified[5] and the process made a success.

Clean Tin Dross Treated Largely Abroad

Apart from the electrolytic and dry-chlorine treatment of old tin cans and scrap tin, giving tin, tin oxide, and tin chlorides as end products, there is an extensive metallurgy. Clean scrap and pure oxides find their ultimate outlet in this country with the enamel makers. It is a reflection on American metallurgy, that I was told that only the enamel makers could compete with the English smelters in their offers on the highest grade of tin dross. The lower grades go to the various white-metal makers, as spoken of under lead. Certain large users of tin have also attempted resmelting their own drosses to metallic tin in small blast furnaces. However, it was found that the resulting metal drossed so fast that it paid better to buy new Straits tin and sell the drosses to white-metal makers.

These white-metal makers, I am told, first matte out the copper, adding lead at the same time, the result being a copper matte, nearly free from tin, a speiss,

Typical Lead Furnace

and a lead-tin alloy, free from undesirable impurities. The speiss is simply circulated, I understand, remaining about a constant quantity. The metallurgy of tin is somewhat complicated by its readiness to act either as base or acid, an apparent high volatility, and its speiss-forming tendencies. However, the formation of undesirable and highly stable silicates can be somewhat avoided by raising the temperature slowly when smelting oxides.

Smelting tin drosses with lead in blast furnaces is also practiced, the tin losses in this case figuring out about 12% of the contents. Of interest, also, especially around large canneries and packing houses, is the fact that tin dross, when heated in contact with a fat and metallic tin, is reduced to tin. This process was patented by Dr. C. Glaser of Baltimore.

[5]Eng. and Min. Journ., Dec. 16, 1911, p. 1189.

Precious Metal Treatment

Upon this subject it is difficult to acquire much that is specific. The refiners of gold, silver and platinum, bar themselves off from visitors with great care, conversation usually being conducted through a 6-in. aperture in a bolted door. This is done not so much through fear of theft, as for fear the precious refining secrets will get away.

In former times when everything in the sweeps of the big jewellers' establishments was barreled indiscriminately, it was practically impossible to sample the sweeps, and they were usually treated as a lot, the sweep smelter charging a certain toll per pound, sometimes as high as 12c., and returning the recovered metal to the jeweller. This had the disadvantage of leaving the jeweller at the mercy both of the smelters' metallurgy (good or bad recovery) and his honesty.

The larger jewellers are now carefully screening their sweepings, and larger pieces are melted at once into sampleable bars, or into bars which can be used again (in the case of silversmiths who do not work in gold). The fine material which passes the screen is then coned, sampled, and sold on an assay basis. For this screening the sweeps are usually pulverized in a ball mill, and screened over about 60- to 80-mesh screens. In the mint an Elspass mill is used for this grinding.

These screened sweeps are usually incinerated, briquetted with litharge and smelted either in shaft or reverberatory furnaces, the resulting bullion cupelled, and the litharge used again. The sweep smelter also meets old cyanide-plating solutions, from which potassium or sodium sulphide will throw down the precious metals. There is also a certain amount of silver recovered from old stripping solutions, either where junk has been stripped before resmelting, or where worn plated ware is stripped before replating, but this recovery is, of course, a mere matter of elementary chemistry with salt and zinc.

I wish to thank the Union Smelting & Refining Co., Kahn Bros., and the Columbia Smelting & Refining Co., of New York, for their especial courtesy in assisting in the preparation of this article; as well as to acknowledge my indebtedness to the Great Western Smelting & Refining Co., the Loraine Smelting & Refining Co., of Chicago, and the Aurora Metal Co., for information furnished me in regard to Western practice. Thanks are also due a number of other individuals and firms who desire to remain anonymous.

The California Gold Dredge—III

By Robert E. Cranston *

The design of screens, tailings stacker and hoisting and pumping apparatus is considered. Revolving and shaking screens are used according to material handled. Lattice-girder stackers are general. Winches, which are motor-driven, are equipped with both friction and jaw clutches and band brakes.

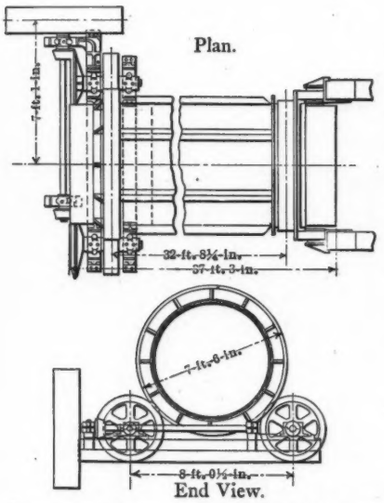
*Mine manager, Ashburton Mining Co., Sacramento, Calif.

Note—An article entitled "Design and Mechanical Features of the California Gold Dredge," published in the Journ. A. S. M. E., February, 1912.

Two types of screen are in common use, the revolving and the shaking. The first dredges used the revolving screen, then the shaking type was introduced at Oroville and for a time most of the dredges were built in this way. On the Yuba it was found that these did not break up the clay in a satisfactory manner and revolving screens were introduced. This type proved better for this district, and since then many have gone back to the revolving screen even in other districts.

Revolving Screen for Clayey Material

The object of a screen is not only to size the material passing through it, but also to disintegrate and wash it. This the revolving screen does more thoroughly than the shaking screen where clay or cemented gravel is present. The shaking screen gives a more even distribution of the fines, requires less power to operate, and its plates last longer and are more easily replaced. For easily washed material I prefer the shaking screen, but for gravel hard to wash, the revolving type is decidedly preferable.



Revolving Screen for 9-Cu. Ft. Dredge.

The design of the revolving screen shown in the accompanying engraving, has been well worked out and little trouble is experienced with this part of the dredge. Most of the delays in its operation are caused by the necessary replacement of worn plates. These plates should be put in so as to be readily removable and not too close a fit made; rather leave considerable space between them, since if this is not done they will spread and be hard to take out. Bolts with countersunk heads on the inside and split washers under the nuts on the outside are used in preference to rivets. They hold as well and can be removed more readily. The screens are built up in sections usually with cast-steel ribs at intervals to retard the movement of the gravel. These steel ribs also serve as a framework, to which are fastened the perforated plates. The size of perforations depends on the conditions and varies from ⅜ to ¾ in.

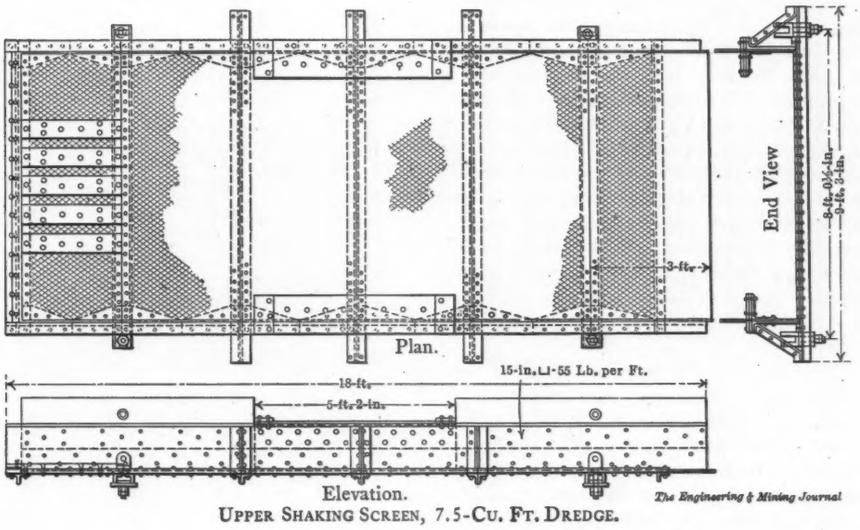
Around each end of the screen is a steel ring or tire preferably made in halves so as to be readily removable. Two drive rollers on which the ring at the upper end of the screen rests are used on most of the older dredges, but a single-drive roller under the center with two side guide rollers is coming into use on the newer boats. The rollers driving the screen are themselves driven by beveled gears and pinions. Owing to the difficulty of keeping grit out of these gears they are made of manganese steel, with a soft-iron core cast in the hub. Rollers are used at the lower end to support the screen and a pair of manganese-steel thrust rollers are provided to keep the screen from moving toward the stern. The bevel gears are driven from a countershaft above the screen, the driving motor also being situated there. The countershaft is used in order to reduce the speed properly, so that excessively large gears or pulleys need not be used.

At the lower end of the screen is a hopper which directs the coarse gravel on to a belt conveyor. In order to prevent clogging at this point the hopper should be placed on a grade of not less than 30 deg. and should be raised on the side on which the revolving screen moves upward, the gravel being carried up on this side of the screen.

The Shaking Screen

The shaking screen, shown in the accompanying illustration, is built with channel-iron sides. The bottom is formed of angle-iron cross-pieces, to which are bolted the perforated plates. The angles should extend beyond the sides so that the top of the channels may be braced from their ends. The screens are built in pairs and mounted tandem so as to balance each other, one moving forward when the other moves aft. They are suspended from the timbers above, some using adjustable, others nonadjustable rods. The upper and lower bearings for these rods should be made of ample size, since they wear surprisingly fast considering the small movement. The lower end of the after screen is constructed so as to direct the coarse material to the short discharge chute on to the conveyor. This part of the screen is not perforated. The size of screen perforations depends on conditions and as in the revolving screen varies from ⅜ to ¾ in.

The shaking screens are driven by means of four connecting rods, operated either by cranks or eccentrics on a



Upper Shaking Screen, 7.5-Cu. Ft. Dredge.

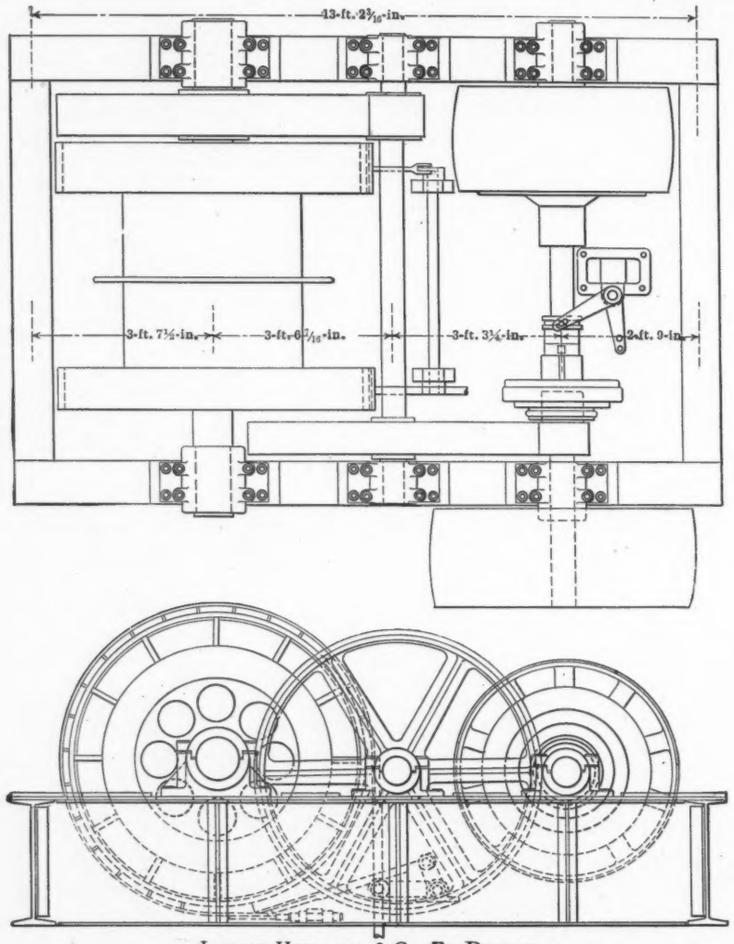
thwartship shaft. I am inclined to favor the eccentric drive owing to its larger wearing surface. If eccentrics are used they should have long hubs and double keyways; otherwise they are likely to work loose under the constant pounding. The drive shaft may be placed at any convenient point, but a central position between the two screens is perhaps the best. The bearings for this shaft are placed outside the screens, and as near as possible to the cranks or eccentrics, and should be long enough so that they will not beat out under the constant hammering. Buffer springs are sometimes used to take up the strain at the end of each stroke, but this practice is not common. The connecting rods are usually made adjustable and any of the standard methods of fastening rod ends may be employed.

The ordinary form of spray for washing the gravel as it passes down the screen is a perforated pipe or pipes. The water from the high-pressure pump is used, and the holes vary from ¼ to ¾ in. diameter. These holes are so placed as to direct the water where most needed. The spray pipes should have quick-opening valves at their lower ends so that they may be flushed out when the holes become clogged with roots, grass and other small particles of matter. Where much clay has to be washed some of the dredges are using large-sized nozzles set in groups at each end of the screen. It is thought that the large streams break up the clay in a more satisfactory manner than the greater number of smaller-sized streams furnished by the perforated pipes.

Lattice-girder Stacker

The design of a stacker ladder is a simple matter, since the loads and conditions are fairly constant. The lattice girder is the most common type and the strains in each member may be readily ascertained by graphic methods. I use a factor of safety of eight for this ladder. The lower end is supported near the stern of the boat and should be so designed as to allow the ladder to move up and down and also to allow the ladder to swing from side to side. The upper portion is supported by a bridle near the end and one near the middle. The ends of a wire rope are made fast to these bridles, its middle portion passing over a sheave which is in turn attached to the stacker-ladder hoisting blocks. Instead of a single-loop arrangement I prefer to fasten one end of the rope to the ladder hoist block, from thence passing it around a sheave at the upper bridle, then over another at the ladder hoist block, fastening the end to the middle bridle. This puts nearly double the supporting power at the upper end and prevents the buckling upward of the ladder when the dredge is surging badly.

The common method of driving the belt conveyor is by means of a motor set on supports above the ladder, 15 ft. or so back from its upper end. The motor is belted to a pulley shaft mounted near the end of the ladder, on to which is keyed a pinion with cut teeth which meshes into a cut gear on the conveyor-belt pulley shaft. I recommend a large-size drive pulley covered with rubber belting. In order to make the belt contact greater an idler is placed near this pulley which brings the belt up and in contact with it for a large proportion of its circumference. By mounting the motor inside the ladder near the upper end a direct gear drive may be used, but this method has not been found as satisfactory as the belt drive described above. A silent chain drive is now being used a great deal. It allows the motor to be set nearer the drive and is said to work well. Rubber conveyor belts are used and should have an extra thickness of rubber on the wearing side. The most important point is to select rubber of the very best quality.



Ladder Hoist for 9-Cu. Ft. Dredge.
The Engineering & Mining Journal

Distributor and Gold-saving Tables

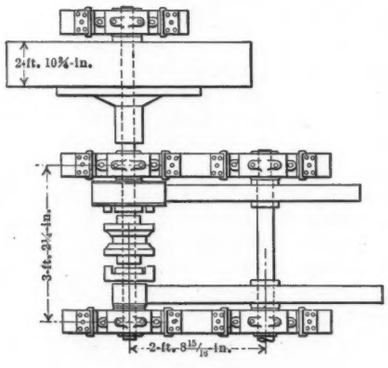
Below the screen is a hopper or distributor which is used to distribute the screened material to the gold-saving tables. Here the ingenuity of the engineer may have full sway. The main object is to get the screened gravel evenly distributed on the gold-saving tables, and the way that it is accomplished makes little difference. The distributor should be designed so that a certain amount of adjustment will be allowed to meet varying conditions. Where a shaking screen is used the problem is simpler than for a revolving screen.

The gold-saving tables belong more to the province of the mining than the mechanical engineer, so they will not be discussed at any length in this paper. Suffice it to say that the gold-saving tables should be specially designed to meet each different set of conditions. They occupy the greater portion of the dredge back of the main gantry and may be built either of plate steel or wood. I prefer steel. The tables are covered with riffles made of angle iron or strips of wood covered with strap iron. The fine material is discharged either at the stern or some distance aft, according to conditions.

The ladder hoist is now usually driven by the digging motor from a countershaft situated on the main deck. In a few cases it is driven from the bucket-drive pulley shaft on the main gantry. Owing

to the load it has to carry it is made very heavy. A structural or cast-steel base is provided, on which are mounted the bearings. Single gearing is used and ordinarily the teeth are not cut. A friction clutch is provided on the pulley shaft to connect this part of the dredge machinery. From the standpoint of rope efficiency, the drums should be made much larger than is common practice, but excessively large drums are not warranted, unless the sheaves through which the same rope passes are made of corresponding dimensions. This entails increased construction cost, but I am inclined to the opinion that it would reduce operating costs sufficiently to warrant some increase in this direction beyond common practice.

The brakes on the ladder hoist must be adequate in capacity and made so that there may be no possible danger of their giving way. If the brakes on the main winch should give way, little damage is likely to occur, but if they fail on the ladder winch a broken digging ladder is the probable result, if nothing worse. The following arrangement has been found very satisfactory. Two band brakes



MAGNETIC CLUTCH AND DRIVE FOR MAIN WINCH.

are used, one being operated by hand from the pilot house, the fixed end of which instead of being fastened to the deck is attached to a lever arm, which through a cross-shaft operates the other brake, thus giving almost unlimited power with little effort.

On most ladder hoists the drum-shaft gear is keyed to the drum shaft and it is nearly always situated close to the drum. It is a much better plan to design the side of the drum in such a way that the gear rim can be bolted to it, thus doing away with the gear spokes, making a much stronger job and taking all driving strain off the drum shaft.

MAIN WINCH

The main winch operates the swinging lines, both bow and stern, raises the spuds, and is usually fitted with one or two headline drums for wrecking and repair work and to step up with when one spud has been broken. The winch is driven by a variable-speed motor which, together with the levers actuating the clutches, is operated from the pilot house. Some form of friction clutch is commonly used on each drum. I have for some time been using an electromagnet clutch on the pulley shaft of the winch similar to the one described for the bucket drive, and jaw clutches for each drum. The jaw clutches are extremely simple and require no attention, whereas a friction clutch is likely to get out of adjustment. Also each winchman wants his clutch set differently, and unless great vigilance is exercised, they will be constantly adjusting these clutches, which means lost time. The friction clutches on each drum are easier to operate, but with a little practice the jaw clutches give perfect satisfaction.

A good many dredges have a separate drum mounted on the after part of the dredge driven from the countershaft of the screen drive. It is used to raise and lower the stack ladder. The drum is driven by a worm gear of such pitch that it will not run backwards from the weight of the ladder. Other dredges have an extra drum mounted with the main winch for this purpose. It is kept from reversing by a pawl and ratchet. Considering the little use this drum gets, its situation and design seem to be of little moment, but a worm drive and separate drum mounted aft are preferable.

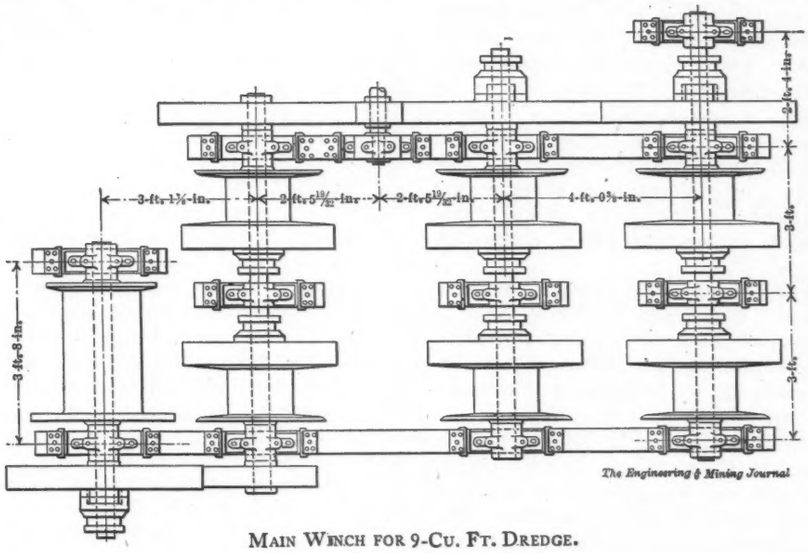
On deep ground and for the larger dredges the bow swinging lines pass from the drum to a sheave or combination of sheaves situated near the bow, then to a sheave on the shore, and from there to the lower end of the ladder. By this method of rigging, little side strain is put on the digging ladder or well hole. The disadvantage of this method is the necessity of a shore sheave and the consequent wear and time lost in moving and handling it. Where the ground is not too deep, a single line, which is simple to operate, but which puts a large side-bending strain on the ladder and well hole, is used. If the ladder and hull are built strong enough, this is not an objection. For the 13- and 16-ft. dredges a single line would have to be very large and would hardly be advisable.

All winch drums are provided with band brakes operated from the pilot house. The connections between brakes and clutches and pilot house are made through bell cranks, rods, etc. Flexible wire rope running over sheaves is used in several instances for the brakes.

Cast iron, cast steel, structural steel and wood are used for foundations. I have been using wood in recent designs, on account of its producing less noise and vibration than metal foundations.

WIRE ROPE SHORT-LIVED

Wire rope is used on the dredges for hoisting the digging and stack ladder,



MAIN WINCH FOR 9-CU. FT. DREDGE.

spuds, for all the swinging lines and for guying the gantries. On account of the small-diameter sheaves, the necessity of the ropes being under water part of the time and the general hard service they get, their life is short as compared with ropes used for most other purposes.

Some dredge constructors use the regular open and closed sockets for their guy-rope ends, and others think this practice is dangerous and use clips. I have never had any trouble with standard rope sockets if properly attached to the rope end. This may be done by first spreading the wire strands, treating them with dilute hydrochloric acid, inserting in the socket with the strands spread broom-fashion, and then filling with melted zinc. The ends of the wires should not be turned over, but left straight. If turned over some are likely to get more strain

than others, and to break and cause trouble.

Different makes and types of wire rope are used. My experience points to standard $^{6}/_{19}$ plow-steel hoisting rope for ladder, spud and side lines and $^{6}/_{7}$ crucible cast-steel standing rope for the guys. Hot Stockholm tar makes a good dressing, also most of the rope greases to be had on the market. Whatever dressing is employed it should be used freely.

The sheaves used for the various purposes are made of cast steel in preference to cast iron. They are bushed with bronze or cast iron and their hubs made as long as possible. When long hubs cannot well be used, as in multiple blocks, the pins should be made of large diameter, so that the pressure will not be too great on each unit of resisting surface.

Centrifugal Pumps Used

Three centrifugal pumps are ordinarily used on the gold dredge. The high-pressure pump should be designed to have a working head of at least 60 ft.; more is better if the gravel is at all hard to wash. This pump furnishes the water for the spray pipes or jets in the screens and is direct-connected to its motor.

The low-pressure pump is likewise driven by a direct-connected motor and should have a head of 20 to 30 ft. This water is piped to the tables where needed, depending on the nature of the gravel and the arrangement of the gold-saving tables.

The priming or fire pump is usually a two-step pump with a working head of 100 ft. or more. This pump is used in case of fire, for washing down decks, in cleaning up, for pumping out the bilge, and for priming the larger pumps.

All pumps should be fitted with both foot and check valves. Bypass piping equipped with the requisite valves should be put in to be used for priming. The foot valves are provided with a grating, and the suction should be still further protected by a wire-netting box attached to the side of the dredge. If this box be made of ample dimensions, say, 8 ft. by 15 ft., a ⅜-in. mesh will work well. If a smaller box be used, ½- or ⅝-in. screen will have to be used; otherwise it is liable to get stopped up.

Three-phase Induction Motors Used

Three-phase induction motors are used on all standard California dredges, variable speed for the digging and winch motors and constant speed for the other pieces of machinery. Lately a form of variable-speed motor has been used for the stacker and screen drive, which gives a better starting torque for getting these parts under way and is particularly useful when it is necessary to start under full or overload. Any of the standard types of motor give most excellent results if the proper sizes are provided.

It is customary to bring the current on to the dredge at 2200 or 4400 v., then transform down on the dredge with three oil-cooled transformers to 440 v. Many of the later boats are using 2200-v. motors, thus avoiding the use of transformers altogether. Beside the three main transformers, another small one reduces the current to 110 v. for lighting purposes. All of the transformers are mounted in steel or asbestos-lined compartments opening to the outside of the dredge. They have pipe connections which allow the oil to be drained off and conveyed overboard to a point some distance from the transformers. These precautions are necessary in order to secure the best insurance rates and are to be recommended as a safeguard against fire. Another precaution which might prove useful is to provide the transformer housings with plate-steel doors hung from the top with an automatic latch at the bottom and so constructed as to be readily dropped and latched in case of fire.

The electric current is brought on board the dredge on floats in a three-conductor armored cable at a point near the stern, this part of the hull having the least movement. An oil switch is situated near this point and is often so arranged that it may be instantly thrown out from the pilot house. From this switch the current is conveyed to the transformers in case low-voltage motors are used and from there the secondary is distributed to the different switchboards. The latest boats use conduits and condulets for all the wiring. If open wiring is used the conductors should not be stretched too tightly and they should all be stranded. The single wires are likely to break under the severe vibration of digging and the movement of the hull and superstructures. I would recommend stranded conductors even with the conduit wiring. For the motors situated on the lower deck their wiring connections can be made through the hold. For the other motors the best method must be determined according to the conditions.

(To be concluded)

Aluminum for Transmission Lines

Aluminum is now extensively used in Europe for electric transmission lines. Many of the principal lines on the coast of the Mediterranean are of that metal; and the Société d' Electricité is about to use it exclusively in the valley of the Rhône. The advantage of aluminum over copper is one of the first cost, and, therefore, depends entirely on the relative price of the metals. For an equal electrical resistance, the weight of an aluminum line is half that of copper (1 to 1.98). If, therefore, an aluminum cable is used instead of a copper one, when the cost of the former per pound is, relatively to the latter, as 3 to 2, a saving of 25% will be effected.

The usual formula for distance between supports, according to the *Boletin de l'Industrie Minerale,* allows a longer stretch for aluminum than for copper wire, a condition which suggests a further saving in supports. But it is pointed out that when wind pressure is taken account of, the distance for aluminum works out as only nine-tenths of that which is suitable for copper. Where an expensive form of support is adopted this disadvantage may go far to neutralize the gain in the cost of the conductor. A small saving in first cost would not be a sufficient set-off against the more careful work and special points required for an aluminum line. Moreover, aluminum is easily corroded by both acids and bases.

Kentucky Barytes and Calcite

Prof. C. J. Norwood in his recently published biennial report of the Kentucky Geological Survey summarizes the results of barytes and calcite investigations as follows:

"Study of the barytes deposits of central Kentucky has been completed and the report is nearing completion. This work is in the hands of F. Julius Fohs. The Survey has proved this to be the greatest barytes district in the United States with an enormous available tonnage. There are nearly 150 veins, some of which have a linear extent of three to five miles, the average length being one mile, and the workable barytes extends to an average depth of about 250 ft. Until the Survey undertook this investigation, comparatively little was known concerning the value of our barytes deposits; indeed, Kentucky was not even mentioned as a source of commercial barytes in publications dealing with the mineral. Some mining was done years ago in one of the veins in Henry and Owen Counties, and in Franklin County, but it was solely for the purpose of obtaining lead, and results were not, upon the whole, remunerative. Mining primarily for the barytes, with lead and zinc as a by-product, is now carried on in a number of localities. Two plants for preparing the mineral for market are in operation, and there is reason to expect that an additional one will be built at an early day. The writer believes that these are merely the pioneers of what will eventually prove to be a great Kentucky industry founded on these deposits.

"Investigations of the calcite deposits were carried on simultaneously with the work on barytes. As one result of the investigation a profitable industry has been established, in the production of a high grade of calcite whiting."

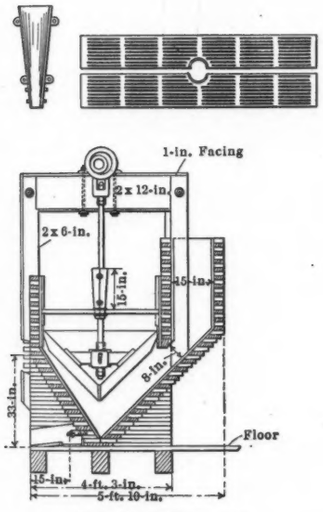
Ore Dressing in the Joplin District—II

By James L. Bruce*

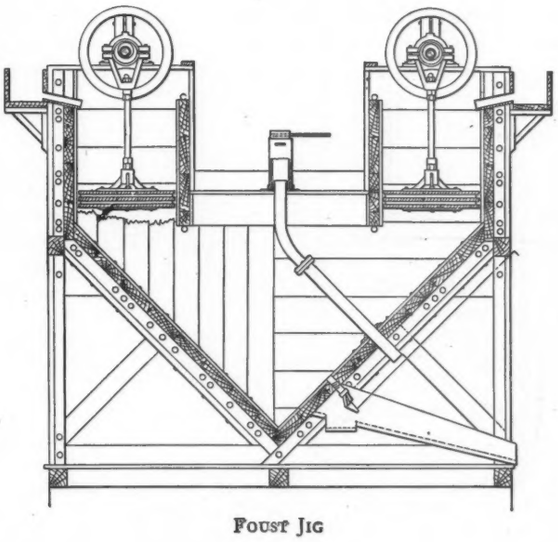
Coarse concentration is accomplished on jigs, three types of which are in general use. The sands are dewatered, sized, classified in some mills and sent to concentrating tables. Methods for treating jig and table middlings vary. The tailings are handled by elevators.

*General manager, Continental Zinc Co., Joplin, Mo.

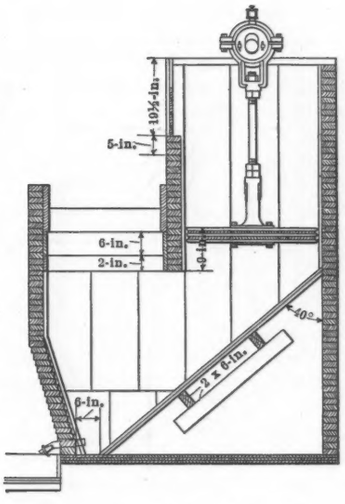
The methods of concentration in use at Joplin originated, I believe, in this district and are not practiced so far as I know in any of the older districts in the world though they have been copied in some of the newer mining districts in the United States and Mexico. With hardly any exceptions concentration is performed in two stages, the first concentration of about 5: 1 of the entire unsized mill feed being done on large 5- or 6-cell rougher jigs operated with a strong suction stroke caused by the hutches being run continually open. This allows the fine ore and sand to be drawn through the jig beds into the hutches. This first unclean concentrate, called "smiddem" is then ready after elevating, for a second concentration on the cleaner jig which makes a concentration of from 5 to 10:1 and separates the feed into lead ore and zinc ore ready for marketing, middlings and tailings, the two latter usually being given subsequent treatment. The treatment of the middlings or "chats" from both the roughers and cleaners, the treatment of sand recovered from the rougher-jig tailings by screening, classifying or spitzkasten, and from various dewatering boxes throughout the mill, and the treatment of the tailings from the cleaner jigs, completes the milling operations and gives rise to many diversified methods of recovering this part of the metallic content.



DEE CONCENTRATOR



FOUST JIG



COOLEY JIG

The Engineering & Mining Journal

THREE TYPES OF JIGS USED

There are three types of jigs in use: the Cooley, the Foust and the Dee concentrator; the oldest and most generally used being known as the Cooley type. This is built in a great diversity of sizes, uniting any number from three to seven cells all of which are set end to end. These cells vary in size from 20x24 in. to 36x48 in. and occasionally larger. The jig is constructed by laying a floor of three thicknesses of 1-in. material, nailing them together and building up the entire jig and partitions between cells, with strips of 2x4 finished lumber nailed one upon the other with two strips of cotton wicking laid between to assist in making it watertight. The front of the hutch is stepped out as the building progresses, until advanced about 8 or 10 in. After building the entire jig up 36 to 48 in. in this manner, a central longitudinal partition is started to form the wall between the screen and the plunger compartments. The plunger compartment is built up from 2 to 3 ft. higher than the screen compartment to give stable support to the jig-shaft journal boxes and to prevent splashing of water. Each cell is lined as high as the top of the plunger with 1-in. lumber, and slope boards are put in at the bottom so that the ore may all be drawn out at the front of the hutch. This leaves a "throat" from 20 to 30 in. deep between the longitudinal partition and the slope boards for the water to pass from the plunger compartment to the screen compartment.

The Foust automatic jig is the recent invention of Henry Foust of Joplin and its success is evidenced by the large number of installations which have been made in the Joplin district (about 50 up to the present) and in other widely scattered fields. The main result sought in designing this jig was to secure a uniform action of the water upon all parts of the under side of the screen in a jig of large size and capacity, whereby a thinner and lighter bed could be carried on the jig and correspondingly less wash water, with its attendant losses of ore, used. These results seem to have been satisfactorily accomplished at only a slight increase in the inconvenience of handling and maintaining. The jig employs eccentrics, plungers and jig screens or grates similar to those used in the Cooley type. It also is divided longitudinally into four or more cells as is the Cooley but is divided laterally into three instead of two compartments, a central screen compartment and on either side a plunger compartment. The partitions between the plunger compartments and the screen compartment extend about 18 in. below the screen and the combined areas of the plunger compartments are about 10% greater than that of the screen compartment. The two eccentric shafts are rigidly connected at their ends by a link or connecting rod which insures exactly parallel motion of the plungers on each side of any cell. An automatic draw off is provided for each cell. This consists of a pipe extending downward through the screen and outward through the side of the jig. A hollow cylinder somewhat larger than the pipe and supported at a variable distance above the

screen, surrounds the top part of the pipe and extends above the surface of the water. Within it a conical valve rests upon the bed and allows the ore to discharge through the pipe when the weight of ore on the bed is sufficient to overcome the weight of the valve and raise it. This keeps the thickness of the jig bed practically constant.

The Dee concentrator, shown in an accompanying cut, is intended to secure the same results as the Foust jig, that is, more uniform action on the bed and less wash water, and at the same time to economize on mill space and head room. The jig consists essentially of a number of screen compartments with the eccentric shaft set directly over them and the plunger rods passing through a loose sleeve in the center of each screen and connecting to hopper-shaped plungers which work directly under the screen. These catch the ore and allow it to pass downward through a hole in the center to the jig hutch below. The inconvenience and mechanical disadvantages of this type of jig are considerable and its advantages have not yet proven attractive enough to secure its installation in many instances.

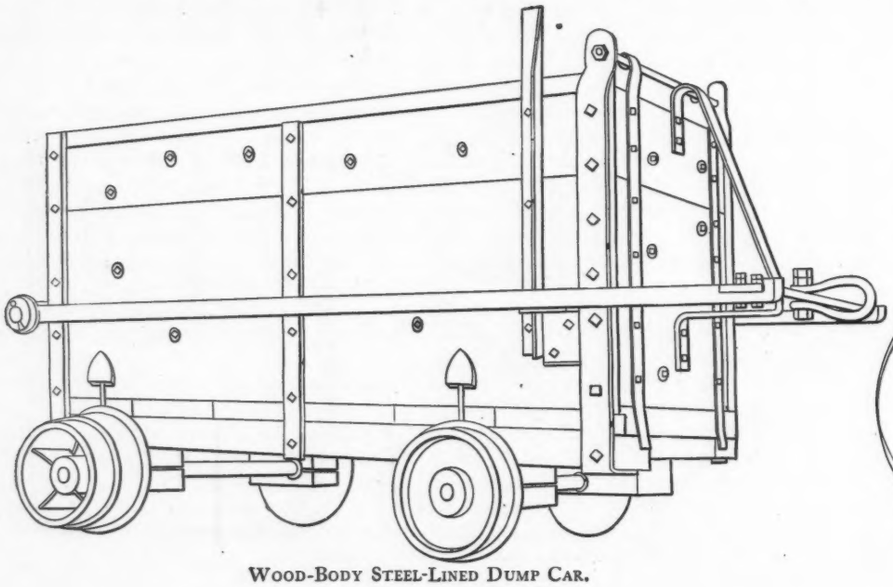
The Richards pulsator jig has been tried out at three different plants and has been removed from each after an unsuccessful attempt to concentrate the ores. Lack of flexibility to take care of the varying rates and richness of the feed, owing to the small size of the cells, seems to be the chief objection.

Jig Beds and Plungers.

Two methods are used for supporting jig beds, that in most common use consisting of a number of iron grates about 6 in. wide and of a length equal to the width of the compartment. These grates consist of several prismatic cast-iron bars set from $\frac{1}{16}$ to $\frac{3}{16}$ in. apart with one of the flat sides uppermost and united by joining them every six inches or thereabouts. These grates have less waterway than cloth, but have the advantage of being much more rigid and easier to clean. Similar grates made of *bois d' arc* or Osage-orange wood are used, especially in places where the water is acidulous enough to be quickly destructive to iron grates. These wear well and last from six to 12 months under hard service. The second method is to use either a wire cloth or perforated sheet steel supported by a wooden frame. The perforated sheet steel has practically all of the advantages of the cast-iron grates as it is rigid and easily cleaned, without the disadvantage of the cloth which is hard to keep clean and which is not rigid except where it is attached to the wooden frame. The sheet has a greater waterway than the cast-iron grates and not much less than the cloth when it is considered that the supports in the framing do not have to be so close together as they do for cloth. In spite of these advantages there are few perforated sheets used. I have found the most suitable perforation to be $\frac{1}{16}$ to $\frac{3}{16}$ in. by $\frac{5}{8}$ to $\frac{3}{4}$ in. hit-and-miss endways with the long dimension of the slot placed across the jig. These do not choke up as much as round perforations and offer less resistance to the water for a given area of water opening. They are more rigid than wire-cloth sheets and allow a better action of the water on the bedding material.

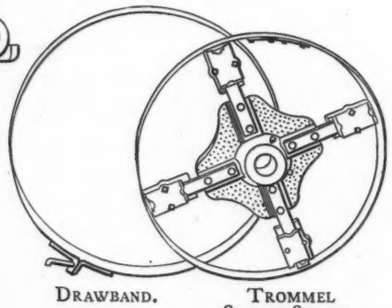
Jig plungers, which operate in compartments lined with 1-in. boards, are made by nailing together five layers of 1-in. boards with the grain of the wood running in different directions in alternate layers. It is well to use the half of a 4x4-in. timber split diagonally and spiked to the under side of the plunger at its edges so as to catch the water better on the down stroke. Plunger rods are attached to the plunger by passing through them and tightening with nuts and lock nuts on to square plates above and below the plunger which may or may not be supported by diagonal bracing. Cast-iron plunger stands are also used and are made as shown in the accompanying figure. This type is especially well adapted for acid water as it keeps the plunger rod entirely out of the water; thus avoiding undue corrosion.

Jig eccentrics are made of cast iron, the hub and yoke fitting as a ball and socket which allows side play of the plunger without binding the eccentric. Eccentrics are made solid to slip over the end of the shaft, or split, so that they may be replaced without disturbing adjoining eccentrics. The amount of throw is made adjustable in various ways on the different types. The split eccentric is a decided advantage on account of the time saved when making a change.



Wood-Body Steel-Lined Dump Car.

Jig Plunger Stand.



Drawband. Trommel Screen Spider.

The Engineering & Mining Journal

"Perfection" molasses gates 1½ or 2 in. in diameter are almost always used for hutch draw offs and their convenience renders them satisfactory except in acid water which soon cuts out their thin castings. For acid water or where the abrasion is severe an excellent substitute, Clark's patent jack gate, has been devised. This exposes to abrasion only two cheap cast-iron disks which slide upon one another with notches that match to form the discharge opening.

Methods of Handling Middlings

The methods used for handling the "chats" or middlings are various but none of them seem to fill the requirements in an entirely satisfactory way. Middlings from a jig or table consist of two types of material: (1) Mixed particles of free ore and gangue which, ow-

ing to their size, shape, weight or the imperfection of the jigging operation, have been drawn off together; (2) particles of gangue which contain unseparated particles of ore in appreciable quantities.

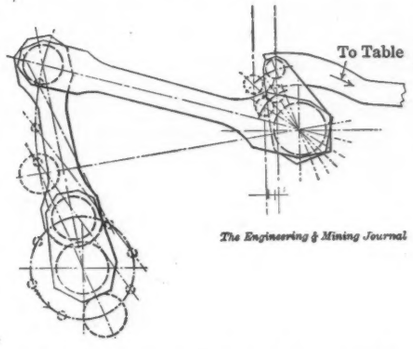
Each of these types needs further crushing either to alter the size or shape, or to free the particles of ore from the particles of gangue, but too much crushing causes sliming of a large part of the ore. In the Joplin district it is the practice of a great many mills to unite the middlings or chats from roughers, cleaner, and tables, sending them to an elevator which delivers to a trommel of from 2-mm. to 3-mm. mesh, the oversize going to the chat or regrind rolls and back to the elevator. In most mills the undersize goes back to the rougher jigs, in some others it is classified, the coarser part going back to the roughers and the fines to the settling tanks and in still others all the undersize goes to the settling tanks and from these to the fine-sand concentrating department.

In many cases I think the most logical course to pursue would be to keep the jig middlings separate from the table middlings and sand, and regrind their oversize from about a 2½- or 3-mm. screen, the undersize going to a 1½- or 2-mm. screen from which its oversize goes back to the rougher jig, while the undersize goes to the concentrating tables. In this system the effort already expended to enrich the middlings, instead of being wasted by returning them to mix with the leaner mill feed, is further assisted by the regrinding, which causes the more friable ore to be crushed finer than the gangue, and the classifying, which delivers only the coarser ore and gangue to the roughers and sends the finer sands and ore to the tables. The table middlings should be reground in separate rolls or other fine-grinding machinery and returned to the classified tables without screening. Sand jigs are used in some plants for handling the coarser sizes of fine sands, but in my experience tables are preferable for sand ranging from 2½ mm. down.

Fine Concentration

For dewatering or settling the fine sand two general types of settling boxes are used: Those having an intermittent draw off; those with a continuous draw off. The former is usually built in the shape of a rectangular box situated outside the mill building, with a partition dividing it into two parts one of which is used for settling while the feed is being drawn from the other. The floor of each compartment should slope diagonally toward that end of the partition nearest the mill, as by this means the small stream of water used for washing the sand to the discharge at the mill end of the partition, can always be kept against the bank of sand insuring a flow of sand as long as the stream of water is kept running. At the same time the water to be settled is fed into the other compartment near the mill end of the partition and overflows at the far end. The advantages of this type of settling box are: Simplicity and freedom from choke-ups, small amount of water withdrawn with the sand; lack of height; accessibility. The disadvantages are: eddying currents; small peripheral overflow and consequent high velocity; inconstant settling areas, the latter decreasing as the tank fills up.

Tanks with a continuous draw-off are usually made either conical or pyramidal with the inflow in the center of round or square tanks or in a trough running down the middle of rectangular tanks, and with an overflow around the entire periphery. The round or square tanks are preferable when sufficient height is available to give the proper peripheral discharge, as all the contents can be removed from one spigot consequently with less water. The sides should slope about 60° from the horizontal otherwise the contents will bank up and occasionally slide off and choke the discharge. An air vent should



Head Motion of Ford Concentrator

be made on each side of the inflow to allow the entrained air to escape without disturbing the surface of the water. Continuous draw-off tanks have the advantage of compactness, uniform settling area, large peripheral discharge and slow velocity, but present the disadvantages in many cases of discharging more water with the sand, requiring greater height, choking more frequently and being less easily accessible.

Several Types of Screens Used

Several types of screens are used for the fine sand. In some mills the tailings at the end of the rougher jigs instead of being dewatered by the customary classifier, mentioned heretofore, are discharged on the outside of a 1½- or 2-mm. cylindrical trommel revolving in the direction of the current. The water going through carries a great deal of fine sand with it and drops into a pan inside the trommel from whence it runs to the settling tanks for the table feed. The tailings are discharged from the outside of the trommel nearly dry. Similar trommels fed from either the outside or the inside, or octagonal ones which are fed from the outside are used in several mills for screening the mill sands, the undersize constituting the table feed, which in many cases is concentrated without classification, and in others after classification in any one of various types of classifiers.

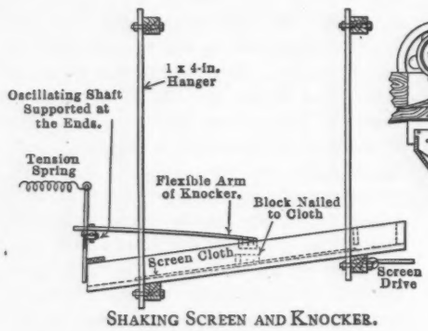
The oversize from the screen or trommel in some mills goes to a four-cell sand jigs in others to the regrind or chat rolls or in still others is returned to the system to again pass over the rougher jig. For screening the mill sands a common type, and owing to its simplicity, low cost, compactness and saving of mill height, a satisfactory one is the ordinary shaking screen. Perforated sheet steel is usually used and choking or fouling of the screen may be prevented in a large measure by fastening a small wooden block on top of the sheet near the center and rigging up a "knocker" to be driven by the motion of the screen as shown in the accompanying sketch. For making three sizes of product I have used one shaking screen mounted above another and sloping in opposite directions with a shield under the upper screen to convey the undersize to the head end of the lower screen. Both screens are driven from one shaft, the throw of the eccentrics being set 180° apart to prevent vibration as much as possible. Shaking screens are supported by four 1x4-in. pieces of wood about 3 or 4 ft. long which are bolted rigidly to timbers above and to the frame of the screen and have sufficient spring to allow of the necessary motion. I have found the best results at speeds of about 300 r.p.m. and slopes varying from 2 in. per ft. to 2½ in. per foot.

The Henry sizing screen has been used in several mills with satisfactory results. The Henry screen, as shown, consists of a shaker screen which is given an upward forward movement on one-half of the revolution and a downward backward movement on the other half and is contained in a framework which supports the driving mechanism. The shaker-screen jacket rests on blades which incline at their lower edge toward the feed end of the screen and these blades dip into the surface of the water in a tank just below the screen. The motion of the screen forces air and water up through the feed and washes the fines down into the hopper-shaped tank below, where they are drawn off by a spigot. The motion at the same time serves to carry the oversize forward. The dash of water against the under side of the screen frees the meshes of particles of sand which are just too large to pass through and prevents clogging of the screen, at the same time washing the fines out of the feed and through the screen.

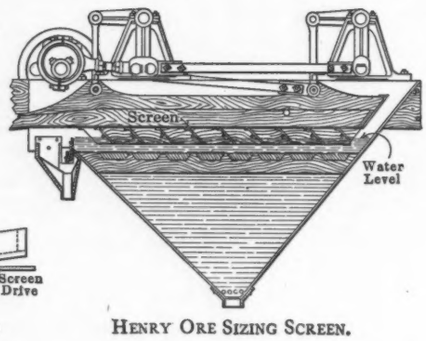
The Ford decagonal outside-feed screen, shown in the accompanying cut,

is made up of ten flat-bottomed trays covered with wire cloth and attached to the screen frame independently. The screen, which revolves slowly, is fed from the outside, allowing the fines to wash through into an inside pan. The oversize drops off into a launder below the screen which is washed clean by a spray pipe inside. The cost of repairs and maintenance is light, the screen seldom chokes up and the screening is satisfactorily done.

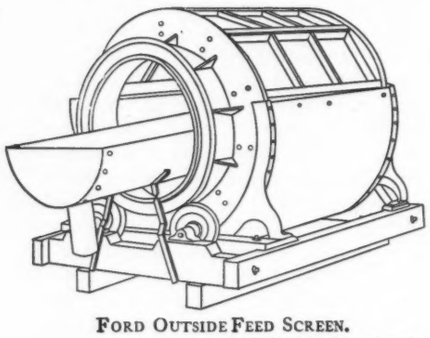
Quite a number of the larger mills and nearly all of the smaller ones furnish an unclassified feed to the concentrating tables, especially as many mills have, if any, only one table. There are, however, quite a number of mills that classify the table feed, but in most cases the classification is exceedingly imperfect owing to lack of care in designing the classifiers. In some cases ordinary inverted pyramids or cones are used with or without a rising current of water. In but few types is a sorting column provided, and most are so constructed that the velocity of the current of water



SHAKING SCREEN AND KNOCKER.



HENRY ORE SIZING SCREEN.



FORD OUTSIDE FEED SCREEN.

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was made in various shapes, one of them being similar to a "buddle" top with the feed at the center and the sweep arm extending radially from the same and rotating over the surface. An improvement over this form was effected when the feed was delivered at one end of a wide rectangular trough, which was mounted on pivots so that the contents could be discharged without shoveling, by turning the box upside down. This later form has been used quite recently to rough the sand and produce a richer and less bulky feed for the tables.

The principal tables in use at present are the Wilfley, Ford, Dunham, Kirk, Arbuthnot, Theurer, Standard and James. The Ford, Dunham, Kirk, Arbuthnot and Theurer are of local manufacture and of somewhat similar design, especially the decks, which are made of specially treated wood with riffles cut in them of various cross-sectional shapes, tapering from their greatest depth at the feed end to a feather edge at the discharge end and running the full length of the deck. The Dunham concentrator has four check

which should raise the finer particles to the point of overflow, decreases greatly as it rises, allowing the particles to come to rest and finally bunch together in masses which settle back and form irregular currents of water in the classifier.

CONCENTRATING TABLES

There are a great many concentrating tables in use and as a natural result quite a variety of types. The first concentrating devices to be used for handling the fine sand were known as sweeps and consisted essentially of a stationary surface over which the wet sand flowed while a moving arm above the surface dragged a cloth of ducking or other heavy material over the sand. This had the effect of loosening the coarser sand and allowing it to be washed further down by the flow of water while the heavier and finer particles of ore settled into the bed. The partially concentrated product thus formed, after accumulating for a time, was shoveled to one side and re-treated until the percentage of metal contents was raised to a satisfactory degree for marketing or for final treatment on a table. The surface of the sweep riffles provided for the purpose of checking the feed from being washed off the table when an irregular feed makes an extra rush of material on the table. It is also provided with a strip running diagonally across the table just below the tailings line for the purpose of saving any ore which might escape the check riffles, and returning it to the system. This would otherwise have to take chances of working its way under all the heavier sand to reach the discharge end. The Ford No. 4 table top and the Dunham No. 1 top are supported on rollers, the Dunham No. 2 on balls, the Kirk, Arbuthnot and Theurer on upright links and the Ford No. 5 is hung on links.

The head motions on some of these tables are extremely smooth running and free from vibration. An accompanying diagram shows the adjustments of the Ford head motion for two different lengths of stroke. All the tables manufactured locally have riffles which extend the full length of the deck and consequently discharge wide bands of mineral which permits of a good classification of different minerals when carefully attended. In my opinion, however, irregularities of feed or feed water cause the lines between bands to shift a great deal more than they do on the Wilfley or Standard tables, requiring careful attendance to secure any advantage from the wide banding. With the large tonnages per hour usually handled in the district I think speeds should be somewhat higher than recommended by manufacturers. I prefer speeds ranging from 250 for the coarser sizes of sand to 280 for the finest sizes. Many tables are operated with much too large a quantity of wash water, especially near the discharge end.

TAILINGS HANDLED BY ELEVATORS

In this district the problem of disposing of the tailings is not in many instances a serious one, owing to the relatively short life and consequently small tonnage produced by most plants. Tailings elevators as high as 80 ft. between centers of top and bottom pulleys operate satisfactorily. These can be made to cover an area of about 180,000 sq.ft. on level ground; estimating the height of the elevator dump box above ground at 70 ft., the average fall is 2 in. per ft., and the tailings pile must lie within an angular range of about 120° from the tailings elevator. Estimating a 30° slope from the top of the pile to the foot of the elevator, the height of the pile will be about 54 ft. This would show room for about 3,240,000 cu.ft. or about 150,000 tons of tailings. As the average slope is often less than 2 in. per ft. the tonnage that may be handled from the mill elevator will run up to 200,000 or more on level ground. When all the tailings possible have been piled in this way the usual custom is to erect a "dummy" tailings elevator at some point on the flume from the mill tailings elevator and re-elevate the material. These elevators are from 20 to 40 ft. high and are driven by a wire-rope drive from the lineshaft of the mill or by an independent engine or motor. This will give a uniform depth of tailings over two-thirds of the first pile and will cover a large additional area besides. Few mills produce a large enough tonnage to require any further means for disposing of the tailings although a few have a second "dummy" which elevates

again from the flume of the first "dummy."

In a number of cases where mills are not making a good saving the tailings are run direct to tailings mills which rehandle them at a profit. The cost of this remilling is in many cases extraordinarily low, reaching 10c. per ton or less irrespective of amortization charges for plant. A large amount of such tailings as are conveniently situated are sold to and loaded by the railways or gravel companies which use them for ballast or ship them to cities and towns for concrete or other commercial purposes. The prices paid for them will run from 1 to 3c. per cu.yd. after deducting the costs of loading.

Power is comparatively cheap and a choice of several types is afforded. Steam engines grade in efficiency from the simple slide-valve engine to the Corliss condensing engine, with steam furnished by boilers, some with and some without feed-water heaters, fired with natural gas, fuel oil or coal. Gas engines, usually either Bessemer, Miller or Foos, are used in sizes ranging up to 150 hp., and are usually quite satisfactory if chosen of a capacity above the demands to be made upon them. The excellent service rendered by the Empire District Electric Co. makes the use of electric power a favorite one in many instances. Slack coal costs $1.60 per ton and mine run $2.10@2.25 delivered on nearest railroad switch; natural gas, 12½@15c. per 1000 cu.ft. for boiler use or 25c. per 1000 cu.ft. for gas engines. Electric power ranges upward from about 0.9c. per horsepower-hour.

(To be concluded)

Gage for Sheet Zinc

Sheet zinc is measured by a distinct gage known as the zinc gage (*Metal Industry*, Feb. 1912). The sizes in this gage are given in the accompanying table.

Gage No.	Decimal Equivalent	Pounds per Square Feet
1	0.002	0.07
2	0.004	0.15
3	0.006	0.22
4	0.008	0.30
5	0.010+	0.37
6	0.012	0.45
7	0.014	0.52
8	0.016	0.60
9	0.018	0.67
10	0.020	0.75
11	0.024	0.90
12	0.028	1.05
13	0.032	1.20
14	0.036	1.35
15	0.040+	1.50
16	0.045	1.68
17	0.050	1.87
18	0.055	2.06
19	0.060	2.25
20	0.070	2.62
21	0.080	3.00
22	0.090	3.37
23	0.100+	3.75
24	0.125+	4.70
25	0.250+	9.40
26	0.375+	14.00
27	0.500+	18.75
28	1.000+	37.50

Compensation to Injured Workmen in Michigan

By P. B. McDonald*

The State Employers' Liability and Workmen's Compensation Committee of Michigan has made its report to the governor, and it is likely that the legislature will enact a law based upon the findings of the committee. The report is of especial interest to the mining corporations of the upper peninsula.

The recommendations contained in the report are briefly as follows:

(1) That the state should take charge of damages paid to employees.

(2) That any such compensation law passed should be optional to the employer, at least until it has been thoroughly tried in practice.

(3) That employees shall not contribute to the funds, but that the physical injury and suffering of the workman shall constitute his proportion of the burden.

(4) That total disability should entitle the workmen to 50% of what his wages would amount to in eight years, or a maximum of $4000. The damages due for a fatal accident would be 50% of six years' wages, or a maximum of $3000. Partial disability, 50% of wages after two weeks. If disabled more than eight weeks, compensation from date of injury.

(5) That employers be given four options (A) to carry their own risks if they can satisfy the board of their financial ability to do so (B) to insure in any authorized company (C) to insure in an employers mutual association (D) to request the commissioner of insurance to assume the administration of the collection and disbursement of industrial accident funds.

(6) That employers mutual associations may be formed by not less than five employers engaged in the same general industry and having not less than 10,000 employees.

(7) That an industrial accident board should be appointed by the governor, consisting of three members, one being appointed every second year after the initial appointment. For the chairman designated by the governor, a salary of $5000 per year is provided. The board may employ assistants and clerical help as necessary.

(8) That a committee of arbitration of three members to investigate accidents, shall consist of one member of the industrial accident board, and two others appointed respectively by the parties in dispute. Either party may demand a review by the board.

(9) That domestic service and agriculture be excluded from the terms of the bill.

(10) That all injuries except such as result from misconduct of the workmen shall be under the terms of the law. While the law shall be optional to all private employers and public-service corporations including contractors doing work for the state or municipalities, it shall be compulsory as to the state and counties, cities, incorporated villages, townships and school districts.

The commission found that plaintiff's attorney fees averaged 40% in one year's damage suits brought by injured workmen against employers. Also of 22 workmen who sued for damage in Wayne County Circuit Court in 1909, 54½% got nothing, while the average recovery was only $884 for partial disablement for life. In 14 fatal accidents in the state at large, the average recovery was only $1248.

Under the present Michigan law injured workmen can recover damages only when it can be proved that the injury resulted through negligence on the part of the employer, with no negligence on the part of the employee or on the part of a fellow servant. Large sums are at present expended by employers as a protection against damages arising from industrial accidents, but only a very small percentage of the sums so expended result in any benefit to the injured.

*Mining engineer, Negaunee, Mich.

Hillside Houses for Working Men

The problems of the lack of comfortable homes for working men, and the unoccupied hillsides around Pittsburgh, have been attacked by the Pittsburgh Civic Commission. In the November *Civic Bulletin* the solution of them as worked out after two years' study is published. Streets with 6 to 8% grades are to be built along the sides of the hills, forming a series of terraces up the hillside, spaced 32 ft. apart for single houses and 92 ft. apart for the blocks of four houses. This bulletin might contain valuable suggestions for certain of the big mining companies.

Conservation of Natural Gas

The much discussed waste of natural gas is stated by the United States Geological Survey to be rapidly decreasing. The problem of conserving the natural-gas supply may be considered as having been satisfactorily solved in Pennsylvania, throughout the Appalachian and the Lima-Indiana fields, and in Kansas. The greatest waste is in Oklahoma and in the Caddo field of Louisiana, owing in Oklahoma to probable looseness in enforcement of the laws and in Louisiana to lack of a market. It is noteworthy that one of the two wild wells in Louisiana that have been sensational examples of waste have been successfully closed and the gas thus conserved for future use.

The Mining Index

A Classified Bibliography of the Current Literature of Mining and Metallurgy

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print), in the original language, for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

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18,241—GAS ENGINES—Methods of Driving by Gas Engines for Collieries. Alan E. L. Chorlton. (Eng. Rev., Jan. 15, 1912; 5 pp., illus.) 40c.

18,242—GAS PRODUCERS—Die Dampfzersetzungsfähigkeit der Gaserzeuger. D. J. Hudler. (Glückauf, Dec. 30, 1911; 2¾ pp.) The capability of gas producers to decompose steam. 40c.

18,243—GAS PRODUCERS—Gasification of Solid Fuel. Charles E. Lucke. (Eng. Mag., Jan., 1912; 7½ pp., illus.) 40c.

18,244—HAULAGE—A Compressor Plant for Mine Haulage. (Coal Age, Jan. 13, 1912; 3 pp., illus.) 20c.

18,245—HOISTING ENGINES—Untersuchungen an elektrisch und mit Dampf betriebenen Fördermaschinen. (Glückauf, Dec. 30, 1911; 10 pp.) Conclusion of article previously indexed. 40c.

18,246—HOISTING MACHINERY—Die neuere Entwicklung der Fördermaschinenantriebe und der Sicherheitsvorrichtungen. A. Wallichs. (Zeit. des Vereines deutscher Ing., Dec. 2 and 9, 1911; 12¼ pp., illus.) Latest development of safety appliances on hoisting machinery.

18,247—HYDRO-ELECTRIC INSTALLATION in the Cœur d'Alenes. George Huston. (Min. and Eng. Wld., Feb. 3, 1912; 4⅓ pp., illus.) 20c.

18,248—LOCOMOTIVE—Die elektrische Lokomotivförderung mit einphasigen Wechelstrom auf der zeche Rosenblumendelle. G. Siemens. (Glückauf, Dec. 9 and 16, 1911; 11½ pp., illus.) 60c.

18,249—LOCOMOTIVES—Erfahrungen mit Grubenlokomotiven beim Steinkohlenbergbau im Oberbergamtsbezirk. Dortmund. Paehr. (Preuss. Zeit. f. B., H. u. S., Vol. 59, Part 5, 1911; 26 pp., illus.)

18,250—LOCOMOTIVES—Versuche mit Motorlokomotiven auf der Grube Dechen im Saarrevier. Otte. (Preuss. Zeit. f. B., H. u. S., Vol. 59, Part 5, 1911; 30 pp., illus.)

18,251—LUBRICATION—Needless Waste of Grease and Oil. E. L. Cole. (Coal Age, Feb. 10, 1912; 1¾ pp., illus.) 20c.

18,252—MECHANICAL STOKERS at the Mines de Dourges Co.'s Works, France. (Engineering, Dec. 23, 1911; 1⅔ pp., illus.) 40c.

18,253—MELTING FURNACE—A New Form of Electric Furnace for Melting Drosses, Brasses, Bronzes, Scrap Metals, Silver and Other Non-Ferrous Metals and Alloys. (Brass Wld., Jan., 1912; 5½ pp., illus.) 20c.

18,254—MINE CARS—Steel vs. Wooden Mine Cars. D. T. Evans. (Coal Age, Dec. 30, 1911; 2 pp.) Paper before Kanawha Coal Operators' Assn. 20c.

18,255—MOTORS—European Explosion-Proof Motors for Mines. E. W. Jansen. (Elec. Rev., Dec. 23, 1911; 2 pp., illus.) 20c.

18,256—POWER PLANTS—Cost Data of Power-Plant Installation and Operation. W. H. Weston. (Eng. Mag., Jan., 1912; 7 pp.) 40c.

18,257—POWER SYSTEM of Cleveland Cliffs Iron Co. C. A. Tupper. (Eng. and Min. Journ., Feb. 3, 1912; 1⅔ pp., illus.) 20c.

18,258—POWER TRANSMISSION—The Generating and Transmission System of the Telluride Power Co. (Elec. Wld., Nov. 18, 25, Dec. 9, 16 and 23, 1911; 15½ pp., illus.) $1.

18,259—PUMPS—Hints on Buying Pumps. John S. Leese. (Eng. and Min. Journ., Feb. 17, 1912; ½ p.) 20c.

18,260—PUMPS—The Testing of Electric Pumps. W. R. Judson. (Mex. Min. Journ., Jan., 1912; 3 pp., illus.) 20c.

18,261—QUARRY EQUIPMENT—Electrical Plant at the Buxton Lime Firms' Quarries. (Electrical Rev., Jan. 12, 1912; 4¼ pp., illus.) 40c.

18,262—SAFETY APPLIANCES in Mines of the Republic Iron & Steel Co. Lee L. Wilcox. (Eng. and Min. Journ., Jan. 27, 1912; ⅔ p.) 20c.

18,263—SKIP-LOADING BINS, Gate for. J. Nelson Nevius. (Eng. and Min. Journ., Feb. 3, 1912; 1¼ pp., illus.) 20c.

18,264—STEAM SHOVEL—130-Ton Steam Shovel for Rock Work. (Eng. News, Jan. 25, 1912; 2⅓ pp., illus.) 20c.

18,265—STEAM SHOVELS—Keeping Shovels at Work at Panama. Fred H. Colvin. (Am. Machinist, Jan. 25, 1912; 5½ pp., illus.) 20c.

18,266—STEAM TURBINES—Use of Low-Pressure Turbines in Mining Work. George E. Edwards. (Min. and Eng. Wld., Jan. 13, 1912; 4 pp., illus.) 20c.

SAMPLING AND ASSAYING

18,267—ELECTROANALYSES—Zur Verwendung des Edison Akkumulators in der Elektroanalyse. Thiel. (Zeit. f. angew. chemie, Jan. 12, 1912; 2¾ pp.) 40c.

18,268—MANGANESE—Rascke Methode zur Bestimmung des Mangans im Ferrowolfram. Slawik. (Chem. Ztg., Jan. 27, 1912; ½ p.) A quick method for determining manganese in ferro-tungsten.

18,269—NITER ASSAY, The. A. D. Banfield. (Eng. and Min. Journ., Feb. 17, 1912; ¾ p., illus.) Comments on a previous article by P. D. Wilson. 20c.

18,270—RAPID METHODS of Technical Analysis. Frank D. Aller. (Colo. School of Mines Mag., Feb., 1912; ¾ p.) Continuation of article previously indexed.

18,271—SAMPLING—Ueber die Probenahme von Rohstoffen und Zwischenerzeugnissen auf dem Hüttenwerken. (Stahl u. Eisen, Jan. 11, 1912; 5¼ pp.) On the sampling of raw material and intermediate products at metallurgical works. 40c.

18,272—SPECIFIC GRAVITY DETERMINATION—Practical Applications of the Specific Gravity or Moisture Flask. H. Stadler. (Journ. Chem., Met. and Min. Soc. of South Africa, Nov., 1911; 4¼ pp.) 60c.

INDUSTRIAL CHEMISTRY

18,273—CALCIUM CARBIDE INDUSTRY. (Am. Fertilizer, Feb. 10, 1912; 1½ pp.) 20c.

18,274—LEAD POISONING—Death from Industrial Lead Poisoning (Actually Reported) in New York State in 1909 and 1910. John B. Andrews. (Bull. U. S. Bureau of Labor, July, 1911; 23 pp.)

18,275—LEAD POISONING—Industrial Lead Poisoning, with Descriptions of Lead Processes in Certain Industries in Great Britain and the Western States of Europe. Thomas Oliver. (Bull. U. S. Bureau of Labor, July, 1911; 190 pp., illus.)

18,276—PIGMENTS—Manufacture of Chemical Colors with Mineral Bases. III. The Green Pigments. (Oil, Paint and Drug Reporter, Jan. 8, 1912; ¾ p.) 20c.

18,277—SULPHATE OF AMMONIA, Plants for Making. C. G. Atwater. (Progressive Age, Jan. 1, 1912; 6¼ pp., illus.) 40c.

18,278—SULPHATE OF AMMONIA—Production and Market for Sulphate of Ammonia. W. N. McIlravy. (Progressive Age, Jan. 15, 1912; 5¼ pp., illus.) 20c.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

E. A. C. Smith is in Europe, but will sail shortly for Chile.

Kirby Thomas, of New York, has been in northern Mexico on professional business.

A. Van Zwaluwenburg has been at Fresnillo, Mexico, and is now at San Antonio.

J. P. Hutchins is at Bogoslawski in the Urals, Russia, examining platinum deposits.

O. V. Waggoner, of San Luis Potosi, Mexico, expects soon to go to Argentina on mining business.

H. G. Wellman, vice-president of the Northern California Mining Co., is at Cleveland, O., for the present.

G. E. Drewitt, who returned to London from the Gold Coast on Feb. 5, will proceed on Mar. 8 to Melbourne, Australia.

John Knox, Jr., general superintendent of the Calumet & Hecla and subsidiary companies, has been in New York on a brief visit.

A. L. von Rosen, of Ciudad Victoria, Tampico, Mexico, is in Jalisco, making investigations of mining properties for American interests.

Cyrus Robinson of New York is at Fresnillo, Zacatecas, Mexico, installing an improved cyaniding plant for the Robert S. Towne interests.

F. M. Kurie left Philadelphia, Feb. 25, for Chloride, Ariz., where he will inspect mining property which is being developed by Philadelphia people.

Wilbur F. McClure, who succeeds Nat. Ellery as State engineer of California, assumed the formal duties of the office on Feb. 13 at Sacramento.

Persifor G. Spilsbury, general manager of the Aguacate mines, sailed from New York, Feb. 24, for Costa Rica, by way of the Panama Canal.

Fritz Cirkel, of Montreal, passed through New York last week on his way to Germany and Italy, where he will remain about two months. His address will be care Koenigliche Technische Hochschule, Aachen, Germany.

Chester B. Allen, manager for the United Gold Mining & Milling Co. in California, is in New York, to meet and confer with T. C. Crawford, president of the company, who sailed from London, Feb. 17. Mr. Crawford will return to London about the middle of March, while Mr. Allen will reach San Francisco about the same time.

The British Government has been officially advised of the treatment inflicted on James William Hambleton, a British agent and a fellow of the Royal Geographical Society, and his family at their home in Parral, Mexico, by rebels or bandits. Ten men entered the house and attacked Hambleton with knives, severely wounding him. His wife was also injured. The raiders forced Mr. Hambleton to go to the office of the Torreon Smelting Co., which he represents, and open the safe, from which they took $6000 in money.

OBITUARY

A correspondent calls attention to the deaths of two scientific men, employed by the government, during the troubles in Mexico. Dr. Pehr Olsson-Seffer, formerly professor of botany at Leland Stanford University, and at the time of his death special government commissioner for investigation of economic products of Mexico, and later appointed professor of botany at the University of Mexico. He was murdered on a train coming from Cuernavaca, in a most cold-blooded manner during the revolution of 1911. Telegraphic reports just at hand from Vera Cruz state that Ernest Hans Angerman, the owner of a plantation called "El Porvenir," situated near Canton de las Tuxtlas, on Feb. 11 was called to his door and attacked by 20 men who overpowered him. After a struggle he managed to escape for some time from his assailants who afterward cut off his retreat from his house, captured and tied him and then literally hacked him to pieces with machetes and knives. Dr. Angerman was a graduate of the University of Munich, spent one year at Frieberg, one at Klausthal and one year at South Kensington, London; studied field-geology at the Ecole des Beaux Arts in Paris, and was then engaged on the Geological Survey in Mexico in 1899 as geologist and continued as such until 1906. His particular work is well known at Mapimi and other limestone districts, in which he made a specialty. While not a member of any American engineering society, he did important work for American and foreign mining companies. Both of the deceased men stood high in their profession and had after many years of work accumulated a competency that enabled them to purchase a ranch in which they took a great deal of pleasure during their spare times.

Societies and Technical Schools

Franklin Institute—The Franklin Institute, of Philadelphia, acting through its Committee on Science and the Arts, recently awarded the Elliott Cresson gold medal, the highest in the gift of the institute, to the following gentlemen: Alexander Graham Bell, of Washington, D. C.; Samuel Wesley Stratton, of Washington, D. C.; Albert A. Michelson, of Chicago, Ill.; Alfred Noble, of New York; Elihu Thomson, of Swampscott, Mass.; Edward Williams Morley, of West Hartford, Conn.; Johann Friedrich Adolph von Baeyer, of Munich, Germany; Sir William Crookes, of London, England; Sir Henry Enfield Roscoe, of London, England.

University of Idaho—R. S. McCaffery, professor of mining at the University of Idaho and president of the Spokane local section of A. I. M. E., presided at the meetings held in Spokane, Feb. 17. Of the University men that attended the following gave papers: D. C. Livingston, assistant professor in mining, on "Mining Methods in Nacozari, Sonora, Mexico"; H. Maguire, on "Replaceable Lips for Elevator Buckets"; C. H. Loux, on "Surveying under Difficulties." At the Northwest Mining Convention held Feb. 15, 16 and 17, in Spokane, Prof. C. A. Stewart, head of Mineralogy and Geology at the University, gave a discussion on the needs of a State Geological Survey for Idaho. To this end resolutions of endorsement were passed. At this meeting, also, J. W. Strohecker gave a paper on "Relations of Mining Schools to the Mining Industry."

International Technical Congress for the Prevention of Industrial Accidents and for Industrial Hygiene—The new American idea of the safety engineer, an accident-prevention specialist, will be brought to the notice of the world industrialists at an International Safety Congress, to be held in Milan, Italy, for five days, beginning May 27, 1912. This congress, the first of its kind of international scope ever held, will be for the purpose of setting in motion a world-wide movement for the conservation of human life in industry. The American Museum of Safety, 29 West Thirty-ninth St., New York, is making preparations so that the United States will be well represented. An American national committee has been selected by the American Museum to cooperate with the International body and to promote American ideas and views at the congress. Dr. W. H. Tolman, director of the American Museum of Safety, and other members of the committee, will attend the congress.

The following are some of the papers which will be read at the Milan congress: "The Safety Engineer on a Large Transportation System," by Dr. W. H. Tolman, chairman, American National Committee; "How the New York Edison Safeguards the Lives and Limbs of its Employees," by Arthur Williams; "The Work of the Safety Committee of the United States Steel Corporation"; "Safeguarding the Traveling Public and Protecting the Employees of the Electric Street Railway Association"; "Proper Illumination and Accident Prevention," by J. V. Lansingh, president of the Illuminating Engineering Society.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Feb. 21—Louis R. Glavis, secretary of the State Conservation Commission, states that the speculative holders of water-power appropriations, referred to in the JOURNAL of Jan. 27, did not receive permits from the commission, but that these appropriations were made before the law creating the commission became effective. He further states that the law does not give the commission the proper machinery for the enforcement of the provisions; that the aid of the courts would have to be invoked in order to provide against improper application of the permission to appropriate water for power and electrical purposes. There have been issued by the commission about 20 permits to persons applying for the right to appropriate water for mining-power purposes since the commission has been in operation.

An investigation into the conditions, causes and possible cure of the damage being done in the oil fields from the infiltration of water, will be undertaken by State Mineralogist Storms in a personal visit to the fields. He will make an inspection to acquaint himself with the conditions and will confer with operators and ask their suggestions as to methods of controlling the water and the proper procedure to prevent a continuance of the evil. The subject has attracted a good deal of attention and laws have been enacted which permitted each county to provide means and appropriate moneys for the regulation of the wells that cause the damage; but the counties have not been alive to the necessity of spending the money required. While it may not be within the power of the state mineralogist to control or regulate the operation of oil wells, the information and suggestions obtained will enable him to act in such way as the law or his position may provide; if the matter can be successfully dealt with under a state law greater consideration will be given it by the Governor and the Legislature when the recommendation comes from an official whose office is concerned with the betterment of the mining industry than when offered by persons directly interested in saving their own property from the invasion of water from the wells of careless owners.

The Southern Pacific Land Co. is a new incorporation, with railroad officials as directors, organized for the reported purpose of handling all lands owned by the railroad. This management, it is said, will extend to the oil lands in Kern and Fresno Counties, now operated by the Kern Trading & Oil Co., and some valuable holdings on the west side of the Kern River field and in the Lost Hills. The report is also current that the new company is preparing to have these latter holdings operated under lease. The railroad is evidently arranging its affairs to meet the requirements of the Federal laws and governmental regulations respecting the actions of corporations, and to be ready to meet any of the possible demands the Government may make.

Denver

Feb. 23—Thomas B. Crawford, of Denver, has organized the Brown Mountain Smelting Co., and has purchased the Hill smeltery, just below the town of Ouray; this will be operated with present equipment as a pyritic smeltery in a few months, there being an abundance of the ores in the district, which are best adapted for this method of what may be termed a "fusion concentration," the product being a copper matte containing the silver and gold of the ore. The chief local ore supply will come from the Wanakah company, and from the Indian group in Red Mountain, which is under lease to the Brown Mountain company. John T. Roberts, Jr., of Ouray, is manager of the Wanakah company, and he states in his report that in 1911, 400 cars of concentrates, valued at $100,000, were shipped from the mill.

Just now some of the Denver papers contain accounts of fabulous shipments from a camp called High Grade, somewhere in California, but from a district which is so deep under snow that it cannot be examined till spring; there are also published photographs and offers of old-time miners who are willing to go there and stake the whole country if Denver men will provide the money. Colorado camps as a rule do not look to San Francisco for money or for grubstakes, and why California should come to Denver is not apparent.

At the annual meeting of the Elkton Consolidated Mining Co., Feb. 12, the following directors were elected: E. P. Shove, president; E. M. De La Vergne, vice-president and general manager; M. F. Stark, J. W. Graham, A. E. Carlton, James F. Burns and J. Arthur Connell. Sherwood Aldrich retired as president, owing to pressure of other duties.

Butte

Feb. 21—The improved price of copper is beginning to stimulate mining in various parts of the state and preparations are being made to open up numerous properties, where considerable prospecting has been done. Among others, the Cooke City district, in Carbon County, is beginning to revive. A number of years ago this camp was one of the busiest spots in the state, hundreds of claims were staked and a large amount of work done there, showing that the district was primarily noteworthy for its copper deposits. It is in an almost inaccessible region, however, and although much effort has been made to have a railroad built to the district, it has not yet been accomplished, owing to the almost prohibitive cost of construction and the steepness of grades that would be necessary. There is scarcely a doubt that the region would become a great mining center with proper transportation facilities, but it has been shown that ore shipments by wagon over a rough, steep road, 60 or more miles long, were not profitable, except for the highest-grade ore.

At the slime pond at Anaconda, a new system of centrifugal concentration is being tested, which, if as successful on the large scale necessary at that immense plant as it is proving to be on the small scale of the tests, promises to improve the concentration of slimes.

In the mines of Butte opportunity is being taken of the present price of copper to work over much material which in former years was regarded as waste, and which now pays well to mine again. Much of the filling of old stopes is thus made to yield a second profit and the mining of this material helps to lengthen the life of the mines. The average grade of ore being mined at present is about 3.5%, which is considered a good grade, and it is the company's policy to mine the low-grade ore while copper is at a good price and to leave the high-class ore for times of lower prices. When the price of the metal is up it is often found profitable to mine first the orebody and in after years to remine the filling, which in the meantime has become enriched, not only by the inevitable escape of part of the ore into the waste material, but also by seeping, copper-bearing waters, and there have been cases where the waste filling of stopes has been reworked several times at a profit.

Salt Lake City

Feb. 22—The lead furnaces of the International Smelting & Refining Co.'s Tooele plant are being warmed up, and it is probable that operations will begin the middle of next week. It is expected that E. P. Mathewson, general manager, and other officials will be present at the ceremony of blowing in.

The results of development work at the Utah Apex during the last eight or nine months have been remarkable. During that period two important orebodies have been opened, one containing 40,000 tons of high-grade lead ore, and the other 60,000 tons of 15 per cent. lead ore containing a high iron content, but as yet the limits of the orebodies have not been determined. One stope shows the ore to be 100 ft. thick. There is a good tonnage of probable ore. The orebodies are being steadily added to and the reserves increased.

The U. S. Geological Survey report on the San Juan oil field in the southeastern part of Utah, made by E. G. Woodruff, gives the past history and present status of the field. The first location was made in 1892, but no drilling was done until 1907, when the first well, Crossing No. 1, was begun. Oil was encountered Mar. 4, 1908, the well turning out to be a gusher. There was considerable excitement, and other wells were found in rapid succession. Little real work was done, however, until 1910, by the summer of which year there was one standard rig in operation, and others reported to have been ordered; there were 10 portable deep-well rigs in the field, and several more on the way to it. On Feb. 1, 1911, 27 drilling rigs were in the field, and equipment for more was on the way. Two oil wells were brought in during that winter. A small town had been built near Mexican Hat and the roads improved.

There is little doubt but that transportation can be arranged; a pipe line to the nearest railroad could be built. Two railroad lines, both of which are pronounced practicable by engineers, have been under consideration. It remains for prospectors to show that there is enough oil to warrant the expense of the pipe line or railroad.

The areas which are regarded as offering the most favorable conditions are as follows: T. 41 S.—R. 18 E., sections 23, 24, 25, 26, 35, 36; T. 41 S.—R. 19 E., sections 19, 20, 21, 28, 29, 30, 31, 32; T. 42 S.—R. 18 E., sections 1, 2, 11, 12, 13, 14, 24; T. 42 S.—R. 19 E., sections 5, 6, 7, 8, 17, 19, 20. As all wells containing more than a good "showing" are in the syncline, it is believed that the basin structure probably contains the most oil. Practically all geological conditions point to the conclusion that few flowing wells will be obtained. No adequate explanation has been offered for the one gusher reported.

Negaunee, Mich.

Feb. 23—It is reported that the Chicago, Milwaukee & St. Paul Ry. will build an extension from Crystal Falls to Iron River. Surveys have been made in the past and several possible routes mapped out. The proposed extension will be about 20 miles in length. At present the only road at Iron River is the Chicago & Northwestern Ry. over which road all the ore shipments are made. The C. M. & St. P. Ry. is making extensive repairs to one ore dock at Escanaba. At the same place the C. & N. W. Ry. is placing new tops on two docks and tearing down its old No. 1 dock. Some of the timber from No. 1 dock is being resawed for use in the work on No. 6 dock.

The new Jones furnaces erected at the Kloman mine at Republic are preparing to start work on the new process for metallizing low-grade iron ore. The results will be watched with interest by mining men in the Lake Superior region.

A partial walkout occurred at the Chapin mine of the Oliver Iron Mining Co. at Iron Mountain because of a demand by the men that operations be restored to a full-time basis. Half-time work has been in force since last spring. Gen. Supt. O. C. Davidson took the matter up with the company's officials at Duluth and was instructed to put the mine on a 6-day basis but not to increase production; the stockpiles at the mine are already large and there is no call for the ore. The men participating in the walkout are still out, and the others now have work on every day but Sunday.

The plant of the Lake Superior Iron & Chemical Co. at Newberry is now in operation. Extensive improvements and additions have recently been made, including a central power house, a new chemical plant, sawmill, retort plant and an enlargement to the stack. Water is pumped from the Taquamenon River by an electric pump.

Cobalt

Feb. 23—C. W. Knight, of the Provincial geological staff, is collecting data for the publication of another report on Cobalt. It is understood that evidence has lately come to light, which tends to upset the former theories of geologists regarding the origin of the Cobalt ore deposits. This fact, combined with some recent important discoveries, may have an important bearing on the future of the camp. It was reported recently that vein No. 9, at the Coniagas mine, extended into the Keewatin formation. Mr. Knight made a careful inspection of the formation underground and confirmed the reports of the discovery, pronouncing the formation in which the vein occurs to be undoubtedly Keewatin. The vein has widened to 5 in. and an assay taken of the ore shows 2622 oz. silver per ton. The vein has been followed for 85 feet.

Trethewey shareholders are greatly exercised over the publication of the annual report, which presented many disappointing features. A stockholders' commission is being formed, which will try and bring about various reforms. The stockholders advocate the cancellation of the recent $1,000,000 increase in capital, the employment of a consulting engineer to supervise the management of the mill and the mine, the publication of monthly statements of production, and quarterly financial statements. Last, but not least, the decapitation of Col. A. M. Hay, president, is desired. The report for 1911, showed a loss of $50,000 in gross receipts, and a decrease of $77,494 in the net returns, from the preceding year. The cost of production amounted to 27.67c. per oz., which is about 10c. higher than for any previous year.

Toronto

Feb. 23—The Ontario government has introduced a bill into the provincial legislature, providing that no miner shall be employed underground for more than eight hours in any 24 hours, including in such eight hours the time occupied in descending and ascending from the mine. For every violation of this provision, the person owning or controlling the operation of the mine and the manager or superintendent are liable to a penalty not exceeding $50.

It is officially announced that the Elk Lake branch of the Temiskaming & Northern Ontario Ry. will run from Earlton, a point 25 miles north of Cobalt, westward for 30 miles through a country well suited for agriculture. The Charlton route, at first proposed, was abandoned on account of the superior character of the country for farming purposes to be opened by the route selected. Tenders will be called for immediately.

Porcupine

Feb. 23—At the monthly meeting of the Porcupine branch of the Canadian Mining Institute, held a few days ago, two interesting papers relating to conditions in the district, were read. One paper dealt with the development and recording of sampling results, as applied to the Hollinger, while the other took up the question of determining the dip of diamond-drill holes. In the discussion which followed, it was stated that in the sampling done at the Hollinger, the pulp, which was ground to 80 and 100 mesh, did not, in any case, show metallics on the screen. This is rather remarkable considering the fact that the occurrences of coarse gold are frequent, and that over 3000 samples were taken. It was also shown that while in Porcupine the gold is found associated with the pyrites, it is in a free state, and that there is no chemical combination.

The Mining News

The Current History of Mining

Alaska

Alaska-Mexican—During December, the mill crushed 18,858 tons of ore, yielding $58,809 gross and net $30,856. Operating expenses were $24,161; construction, $3791; grade of ore, $3.15; development work, 209 feet.

Alaska United—During December, the Ready Bullion and 700-ft. Claim mills crushed 37,793 tons of ore yielding $90,376 gross and net $13,836. Operating expenses were $74,773; construction, $1766. The ore at the Ready Bullion mill averaged $2.20 per ton; 700-ft. Claim, $2.55. Development work totaled 256 ft. The operating expenses include $15,000 as a portion of the cost of settling the Mexican powder explosion of Mar. 2, 1910.

Red Wing—A vein is being opened about 250 ft. back of the present workings and parallel to them. A shipment of ore was recently sent to Seattle and Mrs. Tola Wyman, owner and superintendent, will go to Seattle to look after the details.

Arizona

Gila County

Summit—A statement has been issued by the directors to the shareholders of the company, which recently surrendered its lease and option on the Gibson mine, 16 miles west of Globe. The report shows that $164,000 were derived from the sale of stock and $28,000 from the sale of ore. The sum of $141,000 was expended at the mine in its development, and $46,000 were paid on the property. The report states further that in the opinion of the directors a sufficient tonnage has not been developed to warrant further expenditure on the property. The directors have secured an interest in a gold prospect in the Radersburg district, Mont., and offer to holders of the Summit company stock, two shares in the Summit Gold Mining Co. for every five shares in the Summit Copper Company.

Black Warrior—P. S. Tate and the Lyle brothers, who are leasing on the 100-ft. level of this mine, are shipping a car of copper-silicate ore to the smeltery at El Paso.

Gibson—The mine, recently relinquished by the Summit Copper Co., is being worked in a small way by the Gibson Copper Co., to whom the mine reverted. Ten men are at work under the supervision of T. Henderson, one of the original owners of the mine, and a small amount of high-grade chalcopyrite ore is being taken out from the fourth level. Ore is being hauled to Miami, preparatory to making a shipment to the El Paso smeltery.

Copper & Silver Zone—Another car of silver-lead ore was shipped from this group recently. Four parties of lessees are at work in ore. The ore is coming from near the surface, there being as yet no deep workings on these claims. The silver occurs as the chloride, or hornsilver, and the lead as the carbonate and galena.

Old Dominion—The concreting of the Kingdon shaft of the United Globe is progressing satisfactorily under the supervision of contractor Paul Michaelson and C. H. Weideman, construction engineer. The first section of 160 ft. has been completed and the work has been proceeding about 12 ft. per day. Work on the second section will begin soon. C. B. Eades is concrete inspector for the company.

Duquesne—From this group, 15 miles west of Globe, there has been shipped another car of gold-lead ore. The last shipment of 39 tons, a few weeks ago, netted about $18 per ton and this shipment is expected to run better. The ore is peculiar in that it contains gold and lead, but no silver. John F. Shaw is manager.

Miami—The three 8-ft. Hardinge pebble mills for the sixth and last unit have arrived, and the sixth unit is running. The type of skip known as the Original Consolidated Mines Co.'s skip has been discarded in favor of the old Kimberly type, which is reported to be giving better satisfaction with less repair cost. Exploration of the company's ground northeast of the present developed orebody, continues by means of churn-drilling.

Southwestern Miami—Hole No. 2 is down 780 ft., and is in iron-stained, silicified schist. Two more churn drills are to be added soon. F. W. Hoar, of Globe, is manager.

Barney—The churn-drill hole in the 400-ft. shaft is 1030 ft. deep and is still in the dacite formation. The hole encountered a large flow of water at 965 ft. and water is now flowing out of the top of the hole.

Live Oak—Enlargement of No. 2 shaft to three compartments is progressing rapidly under the management of the contractor, Jack McIvor. The boilers are being bricked in and the double-drum hoist is being treated. A small amount of development work is being done from No. 1 shaft.

Keystone—One churn drill is in operation on the property, northwest of the shaft. The hole is being drilled through the granite formation that caps the ore in this vicinity. E. B. Tinker is superintendent.

Inspiration Consolidated—Construction work will not be started until a jury in the district court has awarded a compensation to the property owners along the proposed railroad right-of-way from the town of Miami to the Inspiration and Live Oak mines. This will not occur for at least 30 days. In the meantime, construction of the dam across Pinal Creek, sinking of the well on the Inspiration ranch and operation of the experimental mill continue.

California

Amador County

The following number of stamps are dropping at properties on the Mother lode in this county; Zeila, 40; Argonaut, 40; South Eureka, 80; Central Eureka, 40; Original Amador, 20; Bunker Hill, 40; Fremont, 60; Kennedy, 100. The following are hung up: Oneida, 60; Keystone, 60. Twenty stamps are being installed at the Rose, L. R. Poundstone, manager.

Hardenberg—The new vertical shaft is down 670 ft. and will be sunk to a total depth of 1000 ft. before crosscutting. The old inclined shaft was sunk to 900 ft. and on the footwall; the dip of the vein is 62½° E. The present owners are doing practical work by modern methods, with new machinery. The electric hoist has a capacity for 2000 ft. The mine is three miles south of Jackson. N. S. Kelsey is superintendent.

Kern County

Pioneer Midway—The Superior Court of San Francisco has decided that I. Straussberger, general manager of this company, is entitled to $50,000 already received and $100,000 due from the company as commission for making a sale of 640 acres of oil land upon the authority of the board of directors. The payment of the commission was contested on the ground that the directors had no authority to fix and pay the com-

mission. The court held that the agreement was made in legal form and good faith.

PLACER COUNTY

L. C. Cooper, of Winnemucca, Nev., has been notified by the General Land Office that a protest against the patenting of lands at Dutch Flat, which Cooper claims are mineral lands, will be considered by the Land Office. The mineral claims are situated on a railroad section of land.

SANTA BARBARA COUNTY

The recent suspension of operations at 16 wells in the Santa Maria field was in most instances due to necessary delay awaiting the cement work and for other similar causes. Only four of the wells have been indefinitely shut down.

SIERRA COUNTY

Dodson—A pump and hoist are about to be installed at this gravel mine on the Little North Fork by James F. Hunt, who is taking out rich gravel.

Gray Eagle—New grinding pans have been installed and the mill is ready to begin crushing ore.

Tightner—At this Alleghany mine another shoot of rich ore has just been encountered. The vein is 8 ft. wide and shows good ore across the entire width. The 10-stamp mill is running continuously on this ore.

Mexican—C. J. York and brothers, owners of this quartz property at Downieville, are erecting a new stamp mill to be operated by electric power from the Downieville plant.

TUOLUMNE COUNTY

Stanislaus Gravel Mining Co.—This is a new incorporation organized to operate the If I Can mine, near Jamestown. Capital stock is $400,000. The directors are V. D. Knupp, N. M. Ball, W. B. Phillips, E. E. Graham and E. R. Abidee, of Porterville.

VENTURA COUNTY

Union—A refinery of six stills is to be installed at Santa Paula to top the light oils. There has been found a loss from shipping the light oils to Oleum. There is a market for the gasoline and distillates in the small towns and ranches in the neighborhood of Santa Paula. The residue will be shipped by pipeline and steamer.

YUBA COUNTY

Manzanita—A 10-stamp mill of modern type and 2000 ft. of pipeline will be installed immediately at this mine, three miles from Rackerby. A 7-ft. vein has been developed at 265 ft. depth and enough ore is said to be blocked out to warrant the installation of a mill for practical development. The property is owned by the Manzanita Mining Co., Boston, Mass.

Colorado

CRIPPLE CREEK DISTRICT

Mary McKinney—The company, in its annual report, shows: Net earnings for 1911, $120,725; expenditures, $128,608; deficit, $7883; cash balance on hand, $43,536. The expenditures include one $13,000 dividend, and the payment for 2000 shares of the Drainage & Tunnel Co., at par. It has been an off year for the company, owing to the lower levels being submerged and because of waiting for the drainage tunnel to unwater them; this has now been accomplished. Frank Costello is president and P. J. Ryan is secretary and treasurer.

Union Leasing Co.—The Gold Sovereign, on Bull Hill, and the Husted shaft, on the Gold Dollar, of Beacon Hill, both operated by this company, sent out 68 cars in January, the ore running from $8 to $45 per ton. C. G. Jackson is manager.

Forest Queen—It is stated that since Feb. 1, nine cars of good-grade ore have been shipped by John Connor, lessee, at this mine, on Ironclad Hill.

Golden Cycle—The company is installing electric pumps to unwater the mine, and the Vindicator mine will bear its share of the expense; the water is now below the 14th level of the Golden Cycle.

Roosevelt Deep Drainage Tunnel—The deep shafts of the Elkton, Mary McKinney, El Paso, Mabel M., Cresson, Blue Bird, Portland, Granite, Strong, Stratton's Independence, El Paso and Gold King, all Beacon Hill shafts, are being drained by this tunnel with a flow from its portal of 950 gal. per min. The Vindicator and Golden Cycle are said to be the only exceptions.

Colorado Mines & Investment—This company, leasing on the American Eagles of the Stratton Estate, shipped 15 cars of ore in January, which they state yielded from $20 to $250 per ton. It is reported also that Baskett & Co., lessees, on block 206, have struck two feet of $60 ore.

CLEAR CREEK AND GILPIN COUNTIES

On the Victoria level of the Mendota vein, some good lead-zinc-silver ore is reported to have been opened.

Scott—At this property, on Republican Mountain, good lead-silver ore is being drifted on, and 50 tons are ready for shipment.

North American Smelter & Mines Co.—This company owns the smeltery at Golden, more than 400 acres of mining claims in Gilpin and Clear Creek Counties, besides 350 acres which it holds under bond and lease, and is now leasing its ground subject to the stipulation that the product be sent to its Golden smeltery. The Donaldson mine, one of these properties, has been leased to the Rockford Leasing Co., Manager Warren being in charge of the operations.

LAKE COUNTY—LEADVILLE

Ibex—High-grade ore, with free gold, continues to be produced by the Barnes & Wardell lease.

Sugarloaf—Regular shipments continue to be made from the vein of ore recently opened in the old Sherrill workings.

St. Louis—A 54-hp. electric compressor and a 37-hp. hoist are being installed at this tunnel, where a prospecting shaft will be sunk 450 ft. Power will be supplied by the Central Colorado Power Company.

Leadville Mines Pumping Co.—The directors are working hard at the framing of a coöperative plan with the claim owners for unwatering the flooded areas of East Fryer Hill, and they are receiving much encouragement.

Henriette—This and the Maid mines, belonging to the Moffat estate, have, during the last 30 years, produced millions of dollars worth of ore; the company will be reorganized at a special meeting of the stockholders on Mar. 4. In the future the destines of these properties will probably be guided by Philip Argall & Sons, of Denver.

OURAY COUNTY

Camp Bird—In this mine that part of the orebody recently opened by a drift is not being worked, but a shaft is being sunk, from which this territory can be properly explored. Meanwhile operations are confined to uncompleted work on known orebodies.

El Mahdi—Alerio & Co., leasing at this mine, in the Bachelor district, are said to have opened a streak of high-grade silver ore.

Michigan

COPPER

Franklin—The mine is sending about 650 tons of rock per day to the mill and this will be gradually increased until about 1000 tons per day are being handled. The new hoisting equipment is working satisfactorily and the underground conditions are first class, some fine ground being exposed in the drifts from the 33rd level.

Winona—The company will soon be able to double its production, as the second head in the mill is being tried out preparatory to going into regular service. The underground force is being gradually increased and preparations are being made to handle the increased tonnage. Developments in the lower levels are showing a material improvement in the mineralization of the lode.

Mayflower—Notices for the annual meeting to be held Mar. 20, in Boston, have been received by stockholders.

Proxies run to President Fay and Secretary Morrissey. No. 17 drill-hole core has been received in Boston. President Fay states that Nos. 15, 16 and 17 holes have disclosed an amygdaloid orebody 550 ft. long, 300 ft. high and over 50 ft. thick. The lode is highly mineralized, the copper being evenly distributed throughout the entire width. All the sludge from No. 17 hole was saved and assayed between the depths of 1016 and 1088 ft., showing an average of 26.25 lb. copper per ton for the vertical distance of 72 ft. The Mayflower discovery is regarded as important.

Allouez—The installation of surface equipment at No. 2 shaft is going forward satisfactorily and this shaft will be ready soon to begin production on a large scale.

St. Louis Copper Co.—The annual report for the year ended Dec. 31, 1911, shows: Total receipts, $100,688, of which $98,750 were from assessment; expenses, $23,411; balance of assets, Dec. 31, 1911, $55,329, compared with a balance of liabilities of $21,946, for the previous year. Development work included: Sinking No. 1 shaft, 165 ft.; drifting, 128.5 ft.; crosscutting, 76 ft. No. 1 shaft is 15 ft. below the first level. A geological cross-section was made by diamond drilling. The lode called the St. Louis amygdaloid was found, with an outcrop 7160 ft. east of the Kearsarge amygdaloid, and was the only lode showing rock that might carry copper in commercial quantity. The company's land comprises 800 acres.

Iron

M. A. Hanna & Co.—At the new Carpenter property, on Sec. 31, 1½ miles southwest of Crystal Falls, diamond drilling is being carried on by the Cole & McDonald Exploration Co., in order to determine a site for a shaft. A large body of ore has been indicated by drilling and the property will probably be a large mine.

Newport Mining Co.—A new mine hospital has been completed by this company at Ironwood. Another hospital is maintained in the same town by the Oliver Iron Mining Company.

Lucky Star—This property, at Negaunee, owned jointly by the Breitung interests and the Cleveland-Cliffs Iron Co., is being diamond-drilled by the Breitung company, which will operate the mine. A 12x15-ft. shaft is to be sunk near the center of the 50-acre tract; the shaft will be wood lined and of four compartments, consisting of two skip-roads, a cage-way and a compartment for pipe and ladders.

Mary Charlotte—All the hoisting at this Breitung mine, in Negaunee, is now concentrated at shaft No. 2, called the Sunrise shaft. The north drift on the fourth level is being driven to connect with workings from No. 1 shaft in the same manner as the other levels are. It is planned to benefit the underground haulage system by this; the motor will then be able to make a circuit of the level. One diamond drill is in operation underground, two on surface and one at the nearby Breitung-Hematite property. The new concrete dryhouse has been completed at the Sunrise shaft.

Negaunee—The new steel headframe at shaft No. 3 has been completed. The electric hoists have been erected and under test were found to work satisfactorily.

Chapin—The large Cornish pump at the new Ludington shaft has been shut down and repaired. The Riedler pump in the Hamilton shaft is handling the mine water during the shutdown.

Wauseca—At this mine of the Mineral Mining Co., at Iron River, formerly known as the Konwinski Exploration, a new shaft is being sunk.

Oliver Iron Mining Co.—A diamond drill has begun work on the ice in Brown's Bay, on Lake Michigamme. This region is east of the old Michigamme mine. The Cole & McDonald Exploration Co. are doing the drilling on contract. Considerable drilling has been done by the Oliver company in the region south of Lake Michigamme, on the lands of the Michigan Iron & Land Co., whose extensive holdings are under option to the Oliver company.

Missouri

Neck City Mining Co.—This company has made three good drill strikes on 10 acres northwest of the Sitting Bull mine, at Thoms Station.

Wisbrod—A company operating the open pit on this land has been breaking its dirt by hydraulic mining with considerable success.

Minor Heir—This company is installing electric pumps and hoists at its mine northwest of Webb City.

Delta—A Texas centrifugal pump is being installed at this mine at Spring City.

Little Bob—Chapman & Lennan, of Webb City, who are operating this mine at Duenweg, are planning the erection of a mill.

Aberdeen—The company has completed the erection of its mill, west of Four Corners.

American—This company, operating the American Davey mines at Prosperity, has acquired the Endeavor Mining Co.'s 40-acre tract and will connect it with the ground at mill No. 1, and will operate it from there. The American company recently made a shipment of 10 cars, of 70,000 lb. each, of zinc ore from its mines at Prosperity, to the smeltery at Dearing, Kansas.

Montana

Butte District

Butte Central—The directors are reported to have approved the plans for the first unit of the new mill and to have let the contract to the Colorado Iron Works. Work is to commence about Mar. 1 on the concrete foundations.

Butte & Superior—The company is reported to have placed an order with the Nordberg company for a duplex, first-motion hoist, 32x60-in. cylinders, to be delivered within 90 days. It is expected that it will be in operation about June 1, coincidentally with the starting of the new mill and concentrator now in course of construction. This hoist will be designed for operation either by compressed air or steam, and will have a lifting capacity of 30,000 lb. from a maximum depth of 3000 ft. The company is also reported to have ordered a new sinking hoist for use at the Colonel Sellers shaft in the Butte-Milwaukee ground. This shaft is now about 700 ft. deep. The work on the concentrator is progressing rapidly and at the present rate should be in operation in May.

Anaconda—Before the close of the present year it is expected that all the principal hoists of the company will be using compressed air instead of steam for power. The central air plant near the High Ore mine is now being increased in capacity—to double that of formerly, so it is reported. It is said that two more compressors are about to be installed. The three hoists now being operated with air are the Mountain View, Diamond and High Ore. The company is reported to have instructed the Nordberg company to change over the Leonard No. 2, Tramway, Pennsylvania, West Colusa, Original and West Stewart hoists for the use of air, and to have ordered from the same company new hoists for the Leonard No. 1, Modoc and Berkely mines, all to operate with compressed air, and for nine auxiliary hoists to take the place of the chippy hoists at the Diamond, West Colusa, Mountain View, Tramway, Pennsylvania, Badger State, Mountain Con, Neversweat and St. Lawrence mines. These auxiliary hoists, it is reported, will be of the convertible type; in lowering a load, they will act as compressors, forcing air into the receivers, thus aiding the central plant. This is similar to the new hoist recently installed at the Franklin copper mine in Michigan.

East Butte—Reports credited to Robert H. Gross, president, state that the output will probably be doubled in July, when it is expected to reach 1000 tons per day. It is said that the new dust chamber and sintering plant are giving satisfaction, but some adjustments are still necessary. These improvements have been paid for from earnings and are claimed to mean a saving of about $5 per ton of

flue dust handled. In increasing furnace capacity in the future, the present furnaces will be doubled in size instead of installing new ones. This work of enlarging is expected to be completed in July. The smeltery has all the custom ore it can handle at present.

LINCOLN COUNTY

Snowshoe—The vein has been crosscut on the 500-ft. level, to which point the shaft was recently sunk. Reports from the mine are to the effect that the vein shows 11 ft. of ore, much of which is of shipping grade.

Hazel T.—This company, operating the Shaughnnessy Hill properties, expects to crosscut the vein soon at a depth of 300 ft., with a tunnel. There is a good showing of silver-lead ore in the upper workings.

Nevada

COMSTOCK LODE

United Comstock Pumping Association—At the Ward shaft the No. 2 bulkhead, going toward the Gold Hill mines, was recently tapped at 175-lb. pressure, and the old workings for a distance of 1000 ft. were quickly drained. The No. 1 bulkhead, built years ago, still remains to be tapped before obtaining the real flow of water from the Gold Hill district. Several hundred feet of caved ground will have to be passed through before reaching it. The old centrifugal pump on the 2400 level has been removed and the quintuplex pumps on the 2100 and 2475 levels are now in operation. The vertical and horizontal centrifugal pumps for the C. & C. shaft and north-end workings are being installed. They are Byron Jackson pumps, driven by General Electric motors. Considerable mine work remains to be done before the pumps can be effectively operated to lower the water below the 2500 level.

Ophir—An important development was made in the west crosscut from the south drift on the 2100-ft. level last week, a strong quartz vein, fully 2 ft. in width, having been opened, car samples of the ore assaying $30 per ton. The course of the vein is a little south of west and the crosscut will follow the formation. This vein is in the Hardy vein-system, and is situated southerly of the old stopes on this level. The Hardy vein has been the mainstay of the property for two years and it looks as if further ore resources would be opened to the south.

Con. Virginia—Work has been started on cleaning out and repairing the old south drift from the east crosscut from the 2450-ft. station of the C. & C. shaft. After this has been finished, it is proposed to crosscut both east and west at various points along the drift, to the Best & Belcher line. The C. & C. shaft cuts the main Comstock vein at the 2450-ft. level and little prospecting was ever accomplished on the level, especially in the easterly vein system. Second-class ore is being saved from the 2550-ft. level, where sill-floor sets are being installed preparatory to raising to the 2450 level.

Mexican—The new mill is being gradually put into shape, and the returns last week, in tonnage treated and recovery secured, exceed any previous week's run. After a number of finishing touches have been made to the building, the structure will be thrown open to public inspection. Ore from the surface dumps is being used to keep the mill in operation, and stoping in the mine has not yet been resumed.

Crown Point—A good record was made last week, when 600 tons of ore were stoped and hoisted from the 1400-ft. level, the assay value of which was in excess of $5000. This ore was all broken down by hand drilling, the air compressor not having been completely installed. The Yellow Jacket mine is running to capacity on Crown Point ore and will continue to do so for some time to come. The management is making a success of its low-grade mining on the 1400-ft. level, and the stopes are yielding a good profit. Higher-grade ore is expected on the levels below the 1400, when the water is pumped out and development work made possible.

ESMERALDA COUNTY

Goldfield-Belmont—President Heller is reported to have said recently that the orebody on the 400-ft. level is stronger and better than in any other part of the mine. Stoping on this ore will start soon.

NYE COUNTY

Tonopah ore shipments for the week ended Feb. 15 were: Tonopah Mining, 3400 tons; Tonopah-Belmont, 2400; Tonopah Extension, 960; Montana-Tonopah, 952; West End, 770; MacNamara, 350; total, 8832 tons, of an estimated value of $220,800.

WHITE PINE COUNTY

Nevada Consolidated—The Veteran mine is now producing about 1100 tons of ore per day, and it is reported that no more than this will be required under present plans. Four steam shovels are working on overburden and one on ore in the Copper Flat pit; one is working on overburden and one on ore in the Liberty pit. Ore at the Liberty pit is said to be running unusually high in copper. A new shovel is being assembled at the machine shop at Ruth.

Giroux—The Giroux shaft is reported to be cleared of water and the debris cleared away. Sinking will not be resumed at present, but work will be concentrated at the Morris shaft to get the workings in shape for production before May 1, when the contract with the Steptoe plant goes into force. About 1,000,000 gal. per day are being pumped from the main shaft, and the ground between the 1200- and 1400-ft. levels is being slowly but steadily drained.

New Mexico

SOCORRO COUNTY

Socorro—During January approximately 4800 tons of ore were milled, yielding seven tons of concentrates and 28,000 oz. of gold and silver bullion. On account of a shortage of wood at the old power plant, the mill closed Jan. 30 and will start as soon as the new power plant is in commission.

Ernestine—The mine continues to yield high-grade ore, in addition to the regular tonnage of average milling ore. The limits of the oreshoot recently discovered have not yet been determined.

Oaks—The gallows frame, hoist and sundry equipment being installed at the south shaft of the Pacific mine will be placed in commission soon. The shaft will then be sunk as rapidly as possible with two shifts. During January, 162 tons of ore were taken out from development and treated in the Deadwood mill. Work continues in the main drainage and transportation tunnel.

Deep Down—Leasers will soon have the old workings in shape for production, when ore will be sent to the Deadwood mill for treatment. A gasoline hoist has been ordered.

South Dakota

Homestake—The annual report just issued covers two periods, one from June 1, 1910 to June 1, 1911, and the other from June 1 to Dec. 31, 1911. The report for the former period shows: Total income, $5,375,064, compared with $4,621,075 for 1910; disbursements, $4,462,201, compared with $3,834,075 for 1910; surplus, $912,863; deficit after dividends, $397,537; final surplus, $84,211. The account for the second period shows: Total income, $4,784,642; disbursements, $2,605,982; surplus, $1,178,660; surplus after dividends, $414,260; final profit and loss, $498,471. Assets were $22,752,805. Supt. T. J. Grier states that recent operations and developments have been satisfactory. The fiscal year hereafter will coincide with the calendar year. It is stated that there are 1,883,277 tons of ore broken in the mine and remaining in the stopes, and that there is sufficient ore blocked out, but unbroken, to supply the 1000 stamps for 20 years.

Tennessee

Tennessee Copper Co.—The annual report for the year ended Dec. 31 shows total receipts of $577,927 compared with $547,157 for the previous year. After allowing $170,878 for depreciation, there remained net profits of $407,049; after charging off $40,000 to general reserve, a surplus of $367,049 remained. Total surplus at the close of the year was

$1,688,428. According to Pres. Frederick Lewisohn, several events combined to make operations less satisfactory than had been hoped for.

Texas

Nitrate deposits are reported near Marfa, in Presidio County.

Gold in sedimentary formation is reported near San Antonio, and local men are investigating. The gold is found in a clay bed under a bed of coal. Lee Hager, mining engineer, of Houston, recently made an investigation of the property.

Llano County

Llano Gold & Rare Metal Mining Co.—This company is said to be operating the first gold mill installed in the state at its property at Llano. The district is noted for its variety of rare metals, among which are vanadium, molybdenum and tellurium. Alexander McLaren is superintendent.

Utah

Beaver County

Moscow—Five cars of ore have accumulated, as no shipments were made during January, owing to bad roads. The ore averages from $1100 to $1200 per car.

Beaver Gold—This property is in the Newton district near the Sheep Rock. Drifts are being driven north and west on the 70-ft. level of the main shaft. The west drift has opened quartz stringers.

Juab County

Tintic shipments for the week ended Feb. 16 amounted to 189 cars.

May Day—The body of gold ore opened some time ago on the 400-ft. level has been found to continue to the 500. In addition to the work on the 400 and 500, drifting for this ore is being done on the 700. Seven cars of ore were shipped during the week ended Feb. 16 and there is a large amount of ore broken down. The ore averages about $22 per ton in gold.

Uncle Sam—In the Humbug section of the property an orebody is being followed toward the Richmond & Anaconda. The work is about 100 ft. below the old tunnel level in hitherto undeveloped ground. The ore carries silver and lead, and from $15 to $30 in gold.

Opohongo—On the 1000-ft. level drifting is being done for the orebody which has been mined as far as the 700; quartz showing some mineralization has been opened. It will take another 100 ft. of work before the point is reached where ore is expected.

Grand Central—A 40-ft. winze has been sunk from the 2200 in ore recently opened there and the shaft is being extended to the 2300 level.

Gemini—About 50 leasers are working on the upper levels at this property and rich silver ore is being opened in small bunches. Some of it runs several thousand ounces per ton.

Utah Consolidated—A drift to the west from the main tunnel level is following a small stringer of ore. The work is being done to get under an old stope.

Eagle & Blue Bell—The shaft, which is being sunk to connect the 1000 with the 1300 level, where a large body of ore has been opened, is 164 ft. below the former level. A new smelting contract has been made with the American Smelting & Refining Company.

Gold Chain—The company shipped 10 cars of ore during the week ended Feb. 16. Shipments for the last four weeks amounted to 50 cars.

Piute County

Prospectors looking for other minerals are reported to have found potash deposits in a badly broken volcanic region along the Sevier River. Marysvale is the town out of which these prospectors are working.

Bully Boy & Webster—Work on the new 100-ton mill will begin within 10 days and it is expected that the mill will be completed in May. A drift is being driven from the No. 2 tunnel to cut the vein which produced rich ore in the De Witt strike. This work is 300 ft. below the outcrop and 200 ft. below the deepest development of the oreshoot. The management is giving its main attention, however, to the developing and mining of milling ore. There is said to be a large quantity of ore of this character developed.

Salt Lake County

Utah Mines Coalition—The winze from the tunnel level is down 150 ft. in good ore. A raise above the tunnel level, which is also called the 800, has opened galena ore. Shipments are again in progress. A snowslide occurred recently, following the path of the bad slide of a year ago, but did no damage on account of the protected position of the buildings.

Alta Consolidated—This company, which was organized in August, 1911, is paying expenses. Two cars of ore have been shipped recently, which ran 75 to 80 oz. silver and 15 to 20% lead, with some copper. Ore has been opened for about 300 ft. along the Brain fissure. The contact is the objective point. Since October, when shipments began, net smeltery returns have amounted to $15,000.

Summit County

Park City shipments for the week ended Feb. 16 amounted to 4,591,480 pounds.

Daly West—Much development is being done, and weekly shipments of 900 tons of shipping ore are being made. The tonnage of milling ore is being added to, and conditions on the 900-, 1200- and 1550-ft. levels are especially encouraging. The mill has temporarily closed down, on account of lack of water, owing to the freezing of the source of supply. The annual report for the year ended Dec. 31, 1911, shows: Net earnings, $278,259; dividends paid, $162,000; surplus, $116,259; cash on hand, $310,389; ore mined, 88,141 tons; average yield per ton, $9.28.

Thompson-Quincy—The main raise from the 1700-ft. level is up 226 ft., and the contact is estimated to be from 50 to 75 ft. further up. The fissure carries quartz showing a little mineralization with copper staining. The raise looks promising.

American Fork Mining & Power—This company owns three claims near the head of American Fork Cañon, adjoining the Mineral Flat. A tunnel is being driven to prospect at greater depth a fissure outcropping on the surface. Two cars of ore were shipped during 1911 which netted $50 per ton in gold and silver. Another consignment of 15,000 lb. brought $560.

Pacific—The annual stockholders' meeting was held Feb. 6 and the board of directors elected as follows: J. L. Craig, W. A. Stevenson, H. C. Johnson, A. K. Thornton and James Chipman, Jr.

Tooele County

Scranton—An official of the company states that the lead orebody discovered several months ago in the north workings from the Delmonte tunnel has been followed 1000 ft. along the strike, and that it is making into the bedding. A winze has been sunk on this ore a distance of 60 ft., with 6 ft. of ore in the bottom. The work is about 500 ft. from the surface. Some of the ore runs 45% lead and 4 oz. silver.

Uintah County

A strike of oil in commercial quantity is reported to have been made in a well about 10 miles southwest of Vernal.

Canada

Ontario—Cobalt

Cobalt shipments for the week ended Feb. 23 were: Nipissing, 186,169 lb.; Drummond, 180,000; Coniagas, 146,100; La Rose, 65,174; Right-of-Way, 61,380; Hudson Bay, 61,264; Wettlaufer, 60,030; Buffalo, 59,887; Casey Cobalt, 48,000; Provincial, 44,440; Crown Reserve, 43,705; City of Cobalt, 42,000; total, 999,149 lb. Bullion shipments were: Nipissing, 93,233 oz.; Crown Reserve, 20,000; Nova Scotia, 17,300; Trethewey, 1983; total, 132,516 ounces.

Little Nipissing—The Peterson Lake company, that took over this mine recently, will pursue a deep-mining policy in the development of the property. The old workings are being utilized and a drift is being driven on the 340-ft. level to intersect a cross vein which assayed well on the 290-ft. level. If this work

results satisfactorily, the present workings will probably be abandoned and sinking continued at the Island shaft, to a depth of 340 ft., the present lowest level of the old workings.

La Rose—A depth of 210 ft. has been reached in the winze from the third level, making the total depth of the workings 450 ft., the deepest in that section of the camp. This winze will be continued until it is certain that the Keewatin formation has been reached.

McKinley-Darragh—The directors are considering the erection of an aërial tramway, to handle the Savage mine ore for treatment in the McKinley mill; coarse crushing and regrinding of oversize is meeting with success, as is also bypassing of primary fines, for independent treatment in separate units.

Mann—Good ore is being bagged from an opencut on this Gowganda property, and a small shipment will be made soon. Development on a larger scale will be undertaken.

Miller Lake-O'Brien—This company, at Gowganda, has been a steady shipper for the last year and a half. An orebody 140 ft. long has been opened. The vein at the 250-ft. level, where it has been opened for 20 ft., is of somewhat better grade than on the upper levels, running from 1½ to 6 in. of 4000-oz. ore.

Powerful—This company, at Calcite Lake, Gowganda, has struck good ore again at the 150-ft. level.

ONTARIO—PORCUPINE

Imperial—This property has been closed down until further arrangements can be made for financing it.

Bewick-Moreing—It is stated that this company has taken an option on a large block of McIntyre stock.

Wright-Hargraves—The core drill has encountered good ore a short distance below the surface. The property is near Swastika.

American Goldfields—Diamond-drill cores from the 600-ft. level are giving good assays.

Porcupine Union—This company has purchased the three Reilly claims, near Three Nations Lake.

Davidson—It is officially announced that the payments on this property by the Crown Chartered will be completed and a full title acquired. The manager has been instructed to sink to the 200-ft. level and to develop the orebody on the 100-ft. level. A force of 50 men will be employed.

McEnany—A new vein has been cut at both the 100- and 200-ft. levels. It is about 3 ft. wide on the 100-ft. level, widening slightly at depth.

Success—Work on this property has been resumed under the direction of Engineer Gardner.

Dome—The stamp mill, when in operation, will require over 250 tons of ore per day, and in order to supply this amount and maintain a reserve, the number of drills has been increased from 12 to 24.

Schumacher—On this property, lying on the south side of Pearl Lake, which is stated to be rich in surface showings, sinking has begun and development will be pushed actively.

Dome Extension—Some good finds on this property are reported. In No. 4 shaft a crosscut at the 100-ft. level is in 27 ft., showing ore all the way, the orebody being rich in places. Diamond drilling has discovered a 15-in. vein of white quartz at a depth of 227 ft., carrying good gold content. The vein outcrops on surface.

Mexico

The American Smelting & Refining Co. has made an appeal to the State Department at Washington for protection of its smelting works and other properties from robbery and destruction at the hands of the Mexican rebels. This company's plant at Asarco, State of Durango, was attacked by a force of Vasquists and after a short resistance by the Mexican employees the plant was captured and looted.

COAHUILA

Panuco—The Continental Copper Co., of San Antonio, Tex., Otto Koehler, president, will soon start operations at the mine at Panuco. A copper leaching process developed by Arthur R. Tuttle, the manager, will be installed with an initial capacity of 50 tons of ore per day. The mine at one time shipped extensively but has been closed for over two years on account of the low grade of the ore and metallurgical difficulties. It is connected with the main-line of the National R.R. by a branch line built by the mining company.

JALISCO

Santo Domingo—An English syndicate is negotiating for the purchase of this property on the Santiago River, near San Pedro Analco. It is extensively developed.

Espada—This mine, in the Hostotipaquillo district, has commenced shipments of bullion and concentrates. It is controlled by A. J. Vick, of San Antonio, Tex. E. Thompson is manager. The company has leased the Virginia-Mexico mill near it and has made connection by aërial tram. The property has been under development for two years.

MEXICO

Esperanza—During January the mill crushed 17,718 tons of ore. Total receipts were $139,909; expenses, $108,992; estimated profit, $30,917. Development work amounted to 1275 ft. On Dec. 31, ore reserves were estimated by the consulting engineer at 200,443 dry, metric tons, including developed and probable ore, which it was estimated will yield a profit of $638,887. The estimated profit to be derived from the retreatment of the tailings dump is $440,000, making a total of $1,078,887. The balance sheet on Dec. 31, 1911 showed: Cash and assets readily realizable after providing current liabilities and the final dividend of 1911, $700,542.

SAN LUIS POTOSI

Native platinum has been discovered south of the city of San Luis Potosi and an American engineer has made investigations recently. It is probable some explorations will be undertaken. This is the first reported discovery of platinum in Mexico.

Benito Juarez—This extensively equipped gold mine, owned by American capital represented by A. B. Carpenter, of Los Angeles, has been closed for over a year, owing to difficulties of operating during the political disturbances in the country.

SINALOA

Choix Consolidated—A copper smelting plant, complete in all details, was recently shipped to this company from the Mill & Smelter Engineering Co., of New York.

SONORA

Penn-Sonora—J. W. Pender, of El Paso, has gone to Sonora to take charge of the development of a gold property owned by this company in the district of Magdalena, about 25 miles from Nogales. Mr. Pender has recently been in Pittsburg, Penn., to confer with the officers of the company about a proposed 100-ton mill. It is planned to use Lane mills for grinding.

Central America

GUATEMALA

Chiantla Mining & Smelting Co.—The Mill & Smelter Engineering Co., of New York, has recently shipped to this company, near Chiantla, a complete silver-lead smelting plant. This machinery is to be sectionalized for mule-back transportation.

Africa

TRANSVAAL

Gold production in the Transvaal in January is reported as follows: Witwatersrand, 709,280 oz.; outside districts, 27,780 oz.; total, 737,060 oz., or $15,235,030. This is an increase of 27,152 oz. over December, and of 86,033 oz. over January, 1911. In January there were 68 mills at work, having a total of 10,195 stamps. The number of negro laborers employed Jan. 31 was 201,375, an increase of 6126 during the month.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Feb. 28—The coal trade is still in disturbed condition, owing chiefly to the delay in transportation and the shortage of cars on many lines. Current demand is now pretty well satisfied by deliveries, but the accumulation of stocks by large consumers is not making much progress. It is understood that the railroads are storing coal at many points in anticipation of trouble, and this is interfering with other trade. While the special weather demand for coal has ceased, there is a steady call for steam coal in larger quantities.

There is much talk in the East of exports in case the English miners strike, as now seems possible. Large shipments are not possible, however, unless the railroads give better service to tidewater.

The anthracite operators and miners are meeting in New York this week to discuss the mining agreement. The operators do not seem disposed to grant the miners' demands; they asked a week for consideration, and the conference was adjourned until March 5. Nothing further has been done in relation to the Western bituminous wage agreement.

British Coal Trade—Exports of fuel from Great Britain, month of January: Coal, 5,421,175; coke, 113,871; briquets, 148,932; coal sent abroad for use of steamships in foreign trade, 1,516,659; total, 7,200,637 long tons; an increase over January, 1910, of 412,958 tons.

Iron Trade Review

New York, Feb. 28—While there are no new developments of importance in the steel trade, business continues on a good scale, though there are considerable variations in different lines. Probably the most active departments are wire, sheets, plates and tinplates, in all of which buying on a good scale is reported. Prices continue at low levels, and there are no present indications of advances. Structural steel is promising well for spring business and there are large contracts in sight, as well as many small ones coming in. Rail contracts continue to be placed, although there is still much discussion over specifications, and no general agreement has been reached. Car and bridge orders have increased.

Pig iron is, perhaps, a little less active, so far as merchant furnaces are concerned. Foundry orders are numerous enough, but generally small in quantity, and there is much haggling over prices. The ore situation is usettled, and there is not much pressure to close contracts.

The very severe weather has passed and operations at mills are easier. The railroad situation is unsatisfactory still. Transportation is slow and many delays are reported in delivering material.

The Republic Iron & Steel Co. has passed the March dividend on its preferred stock. The company reports that 90 per cent. of the mill capacity is employed, but earnings have been light on account of low prices, and it is not considered policy to pay the dividend at the present time.

Railroad Rates—The Interstate Commerce Commission has found the rate of 63c. per 100 lb. on certain steel products from Mississippi River points to Denver unjust and discriminatory, and has ordered rates of 52c. per 100 lb. on iron and steel bars and of 43c. on plates, sheets and structural steel not fabricated. The Commission has also decided that the increase of present rates on iron and steel in official classification territory shall not be allowed.

Baltimore

Feb. 26—Exports for the week included 1,201,200 lb. steel rails, 684,935 lb. track and bridge material to Port Limon, Costa Rica; 2,391,880 lb. steel billets to Liverpool; 1,580,000 lb. steel rails and 116,165 lb. track material to Glasgow. Imports included 300 tons ferromanganese, 306 tons manganese ore and 340 cases aluminum from Liverpool; 4144 tons pyrites from Huelva, Spain.

Birmingham

Feb. 26—The quotations on pig iron in the Southern territory continue to stiffen around $10.50 per ton, No. 2 foundry and the manufacturers answer inquiries with the statement that the outward movement and the home consumption aggregate more than the make. There is still plenty of pig iron in furnace and warrant yards to meet any and all demands and no preparations are in hand to increase the make. The Southern manufacturers appear to be confident that the present conditions at least will prevail through the better part of the year, if there is not an improvement and as far as can be learned there is no willingness to book any quantity of business for delivery during the latter half of 1912, the present quotations being too strong to overlook prospects for better prices. Inquiries are still strong. The Southern furnace companies are right up with deliveries. Reports have been current that some of the ironmakers in this part of the country have been scaling quotations again but inquiry fails to verify these reports.

Charcoal iron is still selling above $22 per ton with the demand picking up. The scrap-iron market is showing strength with prospects of a better demand.

Furnace repairing is still on throughout the South in the expectation that there will be a strong demand for iron in the near future.

Chicago

Feb. 26—The iron market is flat as regards pig iron and quieter as regards finished products. A few sales of charcoal iron, in carload lots, have been made; coke iron, both Northern and Southern, has little beyond a record of carload sales for the week. The selling agents are not anxious to contract for the last half on the basis of present prices and the melters will not listen to higher quotations. The larger interests are well supplied up to July 1, so that the prospect for several weeks at least is of continued dulness.

Lake Superior charcoal pig iron is quoted at $16.50; Northern No. 2 coke iron at $14@14.50, and Southern No. 2 at $10.50, Birmingham, or $14.85, Chicago. Bad weather has interfered with shipments of pig iron in the last week, and arrivals of coke have been so generally delayed as to cause serious scarcity of coke in the city market.

Railway-track supplies continue to sell fairly well, but there is little new business in steel rails, though inquiries are out for some good-sized lots. An order of 2000 tons has been received by the Illinois Steel Co. from the Kansas City Terminal road. Structural-material contracts are numerous, though not for large tonnage in any one case, and prices continue at 1.28c.@1.33c. for material under 15 in. Bars are in lessened though fair demand, with bar iron 1.15@1.20c., and soft-steel bars 1.25@1.33c. Business in sheets and plates also is quieter, but still good; wire products are active. General business conditions are somewhat better, with touches of spring activity appearing.

Cleveland

Feb. 26—A few additional sales of iron ore are reported, but there is still uncertainty as to prices.

Pig Iron—The market has been quiet, so far as new business is concerned. Quotations, Cleveland delivery, are $15.15 for bessemer, $13.10@13.25 for basic, $13.25 for No. 2 foundry and $12.50 for forge.

Finished Material—Some good contracts are reported for plates and shapes for shipbuilding. Several contracts for structural steel have been let. Railroad material has been in some demand. Prices for bars, sheets and plates are reported lower in several contracts recently let.

Philadelphia

Feb. 28—Eastern furnace interests comment favorably upon the evidences of a diminution in stocks at Southern furnaces because of the prospect of less acute competition in Eastern markets. Eastern furnaces have very little stocks and are fairly well sold up for a few weeks to come. The inquiries within a week for low-grade iron have eliminated a weakening tendency and the requirements now before makers will be filled at fractionally better terms. The pipemakers are in the way of shortly securing a great deal of additional work. Already some inquiries have been made with a view of protecting these anticipated requirements. The low rates for malleable and the known shortage of ready supplies have stimulated inquiry and sales during the week, which will probably lead to still further transactions. There are several large foundry interests in the New England states as well as in New York which are ready to contract for summer delivery but the question of ore and its price is delaying final negotiations. The usual business in forge iron is reported. No. 2 X foundry contracts average $15 and they are mostly small, with gray forge and basic close to $14.25, which is a trifle weaker than a short time ago. A fair brand of Southern gray forge is offered at $13.50 here.

Steel Billets—The activity in crude steel in Western markets is reflected here and in two instances business was closed for moderate quantities at about 50c. above some sales for the past two weeks.

Bars—Bars continue firm under a little freer distribution from mills, partly because of reviving activity from jobbing sources. The inquiries for car-building purposes constitute the backbone of the market at present. While manufacturers are anxious to keep a lot of work ahead there is an abatement of the intense competition which characterized the market during the dead of winter.

Sheets—For some reason not apparent there have been fewer large contracts for sheets, but an increase in retail distribution in both city and country stores. At present galvanized material is inquired for.

Pipes and Tubes—Inquiries for tubes were submitted to manufacturers this week and, while discounts remained where they were, consumers looked for some concessions for contracts extending over a considerable period. Merchant pipe is weak and inactive. Cast pipe is strong.

Plates—The week's business is below the average. The amount of business in sight has increased through inquiries. The mills are well filled with business and a week or two of dullness makes no difference.

Structural Material—No orders are reported for several days. Quotations are not as strong, notwithstanding the mills are well filled up.

Scrap—Dealers report continued indifference and an accumulation of stock which country supplies already arranged for will increase. The scrap market is undergoing a depression which mill necessities do not explain. The inference is that it will be necessary to shade prices on all except No. 1 railroad in order to get rid of it.

Pittsburg

Feb. 27—The tone of the iron and steel market is appreciably weaker, though the change is in the sentiment rather than in the amount of business the mills and furnaces are actually doing. While new buying continues light, and is probably lighter than 30 days ago, there is no dearth of material on which to work, as the merchant furnaces are able to ship pig iron as fast as made and the mills have specifications to maintain the increased pace of production recently attained. The difficulty is a sentimental one. There is very little idle capacity, but this little is having unprecedentedly important effect upon the tone of the market. In certain lines the majority of producers are comfortably sold up, but a few producers are cutting prices generally, apparently having no courage to await the increased demand which, in most quarters, is expected to materialize within a very short time on account of the approach of better weather conditions.

The sheet trade is probably the weakest branch of the finished-steel industry. There has been general and progressive cutting since the market firmed up to a basis of 1.90c. for black sheets, 28 gage, in December, while in the past week the market was cut wide open by one interest, a quotation being made so low that it is claimed buyers were actually frightened, and refused to make purchases when a somewhat higher price might have interested them. The open market is quotable on as low a basis as prevailed in November, when the lowest prices in the history of the sheet trade were made. The special quotation referred to is stated by authorities to be the lowest ever heard. The condition is startling when it is considered that, with the exception of a few plants long idle, the sheet mills are running at a very comfortable gait.

Shapes are fairly firm, and this is also the case with plates, although one interest, making a limited range of sizes, is cutting rather freely. The steel-bar mills are comfortably filled and there is little cutting in this line. Bars, plates and shapes are quotable at 1.10c., Pittsburg, this being an inside price in the case of shapes, but one readily done on plates.

Pig Iron—The market continues very quiet. As production by the merchant furnaces is relatively limited, and the output is comfortably sold, the quietness has not resulted in any weakness. We continue to quote: Bessemer, $14@14.25; basic, $12.25@12.50; No. 2 foundry and malleable, $13@13.25; gray forge, $12.50 @12.75, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburg.

Ferromanganese—Sales of limited tonnages are being made at the full price, which we quote at $41, Baltimore, for prompt or forward, freight to Pittsburg being $1.95 per ton.

Steel—Most of the large mills are behind in deliveries of billets and sheet bars on their regular contracts, and there continues to be a scattering demand for small prompt lots. The mills which are well sold up comprise all the bessemer production in the immediate Pittsburg district, while at Youngstown there are one or two sellers of bessemer material. At Pittsburg, openhearth steel is not as high as bessemer, but there is little unsold tonnage in openhearth, and predictions are made that within a week or two openhearth steel will be higher, through the unsold tonnage being absorbed. We quote: Bessemer billets, Pittsburg, $20 @20.50; openhearth billets, Pittsburg, $19.50@20; bessemer billets, Youngstown, $19@19.50. Sheet bars are not bringing the $1 spread above billets which formerly prevailed, and can be quoted at 50@75c. advance over billets. Wire rods are nominally $25, Pittsburg.

Sheets—As noted above, the sheet market is being badly cut by a few mills, one in particular having named some very low prices. Demand for sheets upon contracts is really very good, some mills having surprisingly heavy mails. The leading interest is operating fully 85 per cent. of its available capacity, counting out two or three small plants which will probably never again be operated, its business being good in both export and domestic markets, so that it is rarely naming competitive prices, and the low prices going are made by relatively few mills. We quote the open market on black sheets $1 a ton lower than a week ago: Black sheets, 28 gage, 1.80@ 1.85c.; galvanized, 2.85@2.90c.; blue annealed, 10 gage, 1.35@1.40c.; painted corrugated roofing, $1.33@1.35 per square; galvanized, $2.47@2.50.

St. Louis

Feb. 26—The pig-iron business seems to be a little better both locally and in other parts of the country. Producers are stiffening up on the price a little, to bring it up to $10.50, Birmingham, or $14.25, St. Louis, for No. 2 Southern foundry as the minimum. The majority of orders are small and for deliveries during the first half. Northern iron is slow and No. 2 is bringing $14.25@14.75, St. Louis.

The demand for foundry coke is fair and 72-hour foundry coke is being quoted around $5.20 per ton, St. Louis.

Canadian Iron

The production of pig iron in Canada in 1911, as reported to the American Iron & Steel Association, was 824,345 tons, an increase of 84,135 tons, or 11.3 per cent., over 1910. The production for 12 years past has been as follows:

1900	86,090	1906	541,957
1901	244,976	1907	581,146
1902	319,557	1908	563,672
1903	265,418	1909	677,090
1904	270,942	1910	740,210
1905	468,003	1911	824,345

The production in 1911 was much the largest in the history of the Dominion. Of the total production in 1911, 799,716 tons were made with coke and 24,629 tons with charcoal, including a small quantity made in the electric furnace.

Iron Ore Trade

Swedish Iron Ore—Exports of iron ore from the Tuollavaara mines in 1911 were 82,933 tons, an increase of 14,604 tons over 1910. Exports from the Luossavaara-Kirunavaara group were 2,469,374 tons, an increase of 423,953 tons. Ore mined from the Grangesberg group in 1911 was 848,885 tons, of which 630,455 tons were exported.

Belgian Iron Ore—Imports of iron ore in Belgium in 1911 were 5,675,207 metric tons; exports, 522,893 tons. As compared with 1910 the imports increased 491,785 tons.

METAL MARKETS

New York, Feb. 28—The metal markets show activity in copper and zinc for the week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Jan. 1912..	$ 1,915,202	$ 5,165,543	Imp. $3,250,341
" 1911..	923,676	9,540,830	Imp. 8,617,154
Year 1912..	1,915,202	5,165,543	Imp. 3,250,341
" 1911..	923,676	9,540,830	Imp. 8,617,154
Silver			
Jan. 1912..	6,027,905	4,358,009	Exp. 1,669,896
" 1911..	5,651,076	3,551,426	Exp. 2,099,650
Year 1912..	6,027,905	4,358,009	Exp. 1,669,896
" 1911..	5,651,076	3,551,426	Exp. 2,099,650

Exports from the port of New York, week ended Feb. 24: Gold, $1,950,830, chiefly to South America; silver, $1,045,572, principally to London and Paris. Imports: Gold, $172,111; silver, $269,619, largely from South America.

Gold—Prices on the open market in London continued at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The chief demand was for India. In New York some gold is still going to South America.

Iridium—Prices are unchanged, $64 per oz. being asked for pure metal.

Platinum—The market is quiet, and we continue to quote $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Silver—The market has had some reaction since the sudden fall to 26¾d. and with inquiry from various quarters, the tendency looks more favorable.

SILVER AND STERLING EXCHANGE

Feb.	22	23	24	26	27	28
New York....	....	58⅜	58⅛	58⅛	58⅛	58⅞
London.....	27 1/16	27	26 1/16	26 1/16	26	27⅛
Sterling Ex..	....	4.8735	4.8715	4.8720	4.8715	4.8710

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Feb. 15, reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£1,395,300	£1,076,800	D. £318,500
China.....	406,000	400,000	D. 6,000
Total.....	£1,801,300	£1,576,800	D. £324,500

India Council bills in London averaged 16.15d. per rupee for the week.

Foreign commerce of the United States, year ended Dec. 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise	1910	1911
Exports	$1,866,258,904	$2,092,373,141
Imports	1,562,904,151	1,532,931,861
Excess, exports	$303,354,753	$ 559,441,280
Add excess of exports, silver		21,918,075
Total		$ 581,359,355
Deduct excess of imports, gold		20,262,110
Net export balance		$ 561,097,245

The gold and silver movement in detail will be found in the table at the head of this column.

Copper, Tin, Lead and Zinc

Copper—The stiffening tendency referred to in our last report became pronounced right after the holiday when it developed that the quantities of electrolytic copper available at less than 14½c., delivered, usual terms, had been about exhausted. This led to the placing of large orders to cover requirements not yet contracted for and many millions of pounds were sold on Feb. 23 and 24, both for domestic and foreign shipment, and for March and April delivery, these transactions being largely at 14½c., delivered, usual terms, corresponding to 14.30@14.35c., net cash, New York. Throughout the week the demand has been freely met. Some fair sales of Lake copper at 14½c. have been reported and a few transactions as high as 14⅝c. The close is steady at 14½@14⅝c. for Lake; 14.30@14.35c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 14⅛@14¼c. as the average for the week.

The London standard market has reflected the improvement in the quotation for refined copper, and has advanced gradually to £64 7s. 6d. for spot and £65 1s. 3d. for three months, which are the quotations at the close.

Copper sheets are 19@20c. base, for large lots. Full extras are charged and higher prices for smaller quantities. Copper wire has been advanced ¼c. and is now 15½c., carload lots at mill.

Copper exports from New York for the week were 4008 long tons. Our

NEW YORK

Feb.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
22	.....	.....	....	....	....	.....	.....
23	14½ @14⅝	14.25 @14.35	43	4.00	3.92½ @3.97½	6.45 @6.65	6.30 @6.50
24	14½ @14⅝	14.30 @14.35	43	4.00	3.92½ @3.97½	6.45 @6.65	6.30 @6.50
26	14½ @14⅝	14.30 @14.35	43⅛	4.00	3.92½ @3.97½	6.45 @6.75	6.30 @6.60
27	14½ @14⅝	14.30 @14.35	43⅛	4.00	3.92½ @3.97½	6.45 @6.75	6.30 @6.60
28	14½ @14⅝	14.30 @14.35	42⅞	4.00	3.92½ @3.97½	6.45 @6.75	6.30 @6.60

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market; for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Feb.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
22	63¾	64 7/16	68	196¼	192	15¾	26⅝
23	63⅝	64⅜	67¾	195	191⅛	15 11/16	26⅛
24	.....	.....	.....	.....	.....	.....	.....
26	64⅛	64 11/16	68¼	196	191¾	15⅞	26⅛
27	64¼	64 11/16	68¼	195¼	191¼	15 13/16	26¾
28	64¼	65 1/16	68¼	193¾	189¾	15 13/16	26¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

special correspondent gives the exports from Baltimore at 1907 tons.

Tin—Transactions on the London Metal Exchange no longer reflect actual conditions in the market. The most important factors in the trade refuse to adhere to the conditions of the new contract and refrain from doing business on the exchange. Therefore, most of the buying of Straits tin has to be done outside of the Metal Exchange, and the premiums to be paid for Straits over the standard price vary continually.

The standard market ruled fairly firm all through the weak, but closes somewhat easier at £193 15s. for spot and £189 15s. for three months.

Domestic buying was confined to March deliveries, in which a satisfactory business has been done. The quotations in this market followed closely those of London, and the market closes at about 42⅞c. for March delivery.

Lead—The market is unchanged at 4c., New York, the A. S. & R. Co. continuing to supply the demand freely at that price. Some speculative orders were placed for St. Louis delivery at prices higher than the schedule of the Smelting Company, resulting in a quotation there of 3.92½@3.97½ cents.

The foreign market fluctuates within narrow limits and closes steady at £15 16s. 3d. for Spanish, and 2s. 6d. more for English lead.

Spelter—The market is exceedingly firm. Smelters have disposed of practically their entire output up to the end of April, so that the volume of business prior to May must of necessity be small. The few belated buyers who require March and April shipment have to pay varying premiums, but the quotations for deliveries beyond April have also advanced and a good business has been doing for May, while some sales have been made as far ahead as June. Smelters are quite willing to supply the demand for the latter month at reasonable prices, and this accounts for the wide range in the quotations, the close being 6.30@6.60c. St. Louis, and 6.45@6.75c. New York.

The London market is unchanged at £26 15s. for good ordinaries and £26 17s. 6d. for specials.

Base price of zinc sheets is $8.25 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Sales of prime zinc dust were made at 7⅜c. in the early part of the week and at 7¼c. in the latter part. At the close it was freely offered at 7¼c. We quote 7¼@7⅜c. for the week.

Beer, Sondheimer & Co., who have been operating the Altoona zinc works under lease, have temporarily retired from that operation, and in the meanwhile the plant is being run by the Kansas Zinc Co., its owner.

Other Metals

Aluminum—Business has been rather dull and prices remain about the same. We quote 19¼@19½c. per lb. for No. 1 ingots, New York.

It is reported that a provisional agreement has been made between the Neuhausen company and the leading French producers. Negotiations have been opened with the English and Canadian producers to put an end to the sharp competition which has prevailed for over two years. The result is uncertain.

Antimony—Business is inclined to be quiet, at unchanged prices. Cookson's is 7¼@7⅜c. per lb., Hallett's is 7⅜@7½c., while 6¾@6⅞c. per lb. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Business is fair and the market is steady at last prices. The New York quotation is $46 per flask of 75 lb., with the usual advances for small quantities. San Francisco, $45 for domestic orders and $42.50 for export. The London price is £8 7s. 6d. per flask, while £8 5s. is quoted from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

German Metal Trade

Imports and exports of metals other than iron and steel in the German Empire, year ended Dec. 31, were, in metric tons:

	Imports	Exports	Excess	
Copper	213,004	86,036	Imp.	126,968
Copper, 1910	200,774	80,691	Imp.	120,083
Tin	14,691	10,638	Imp.	4,053
Tin, 1910	14,469	10,206	Imp.	4,263
Lead	100,730	47,187	Imp.	53,543
Lead, 1910	81,851	44,981	Imp.	36,870
Zinc	51,239	120,917	Exp.	69,678
Zinc, 1910	41,633	118,721	Exp.	77,088
Nickel	2,704	2,495	Imp.	209
Nickel, 1910	4,693	1,709	Imp.	2,984
Aluminum	10,573	3,415	Imp.	7,158
Aluminum, '10.	9,980	2,377	Imp.	7,603
Minor metals	1,790	16,337	Exp.	14,547
Minor, 1910	1,519	13,294	Exp.	11,775

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the nine months were, in metric tons:

Ores:	Imports	Exports	Excess	
Gold ore	250	.....	Imp.	250
Gold ore, 1910	139	1	Imp.	138
Silver ore	2,695	8	Imp.	2,687
Silver ore, '10	2,091	.....	Imp.	2,091
Copper ore	23,327	27,396	Exp.	4,069
Copper ore, '10.	22,194	23,729	Exp.	1,535
Tin ore	17,971	72	Imp.	17,899
Tin ore, 1910	17,343	25	Imp.	17,318
Lead ore	143,598	3,746	Imp.	139,852
Lead ore, 1910	112,151	2,361	Imp.	109,790
Zinc ore	262,399	48,998	Imp.	213,401
Zinc ore, 1910	240,584	59,440	Imp.	181,144
Nickel ore	14,897	.....	Imp.	14,897
Nickel ore, '10.	9,937	.....	Imp.	9,937
Miscellaneous	10,828	900	Imp.	9,928
Miscellan's, '10	6,468	747	Imp.	5,721
Chrome ore	16,022	1,795	Imp.	14,227
Chrome ore, '10	24,470	386	Imp.	24,084
Pyrites	862,214	11,015	Imp.	851,199
Pyrites, 1910	792,235	9,871	Imp.	782,364

Miscellaneous includes ores of tungsten, molybdenum and other rare metals.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, month of January, figures in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess	
Copper, long tons	13,854	5,910	Imp.	7,944
Copper, 1910	14,124	6,658	Imp.	7,466
Tin, long tons	4,753	4,673	Imp.	80
Tin, 1910	3,158	3,472	Exp.	314
Lead, long tons	14,095	3,572	Imp.	10,523
Lead, 1910	23,501	4,022	Imp.	19,479
Spelter, l'g tons	13,486	663	Imp.	12,823
Spelter, 1910	10,771	754	Imp.	10,017
Quicksilver, lb.	469,650	180,675	Imp.	288,975
Quicksilver, '10	54,197	350,525	Exp.	296,328
Minor met's, tons	604	2,406	Exp.	1,802
Minor, 1910	374	1,496	Exp.	1,122
Ores				
Tin ore and con.	2,335	.....	Imp.	2,335
Tin ore, 1910	2,053	.....	Imp.	2,053
Pyrites	90,340	.....	Imp.	90,340
Pyrites, 1910	97,867	.....	Imp.	97,867

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Miscellaneous metals include nickel, aluminum and the minor metals and alloys.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 24—The high price of zinc sulphide ore was $51; the basis, per ton of 60 per cent. zinc, was $45@48. Zinc silicate sold on a base of $25@27 per ton of 40% zinc. The average price, all grades, was $43.84. Lead was reported sold as high as $54.50 per ton for next week's delivery. The highest settling price of this week was $54, and the average, all grades of lead, was $53.64 per ton.

SHIPMENTS, WEEK ENDED FEB. 24

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,149,340	.....	805,710	$ 92,613
Joplin	907,920	.....	32,610	21,725
Carl Junction	584,260	.....	.....	14,600
Jackson	582,700	.....	12,730	12,815
Duenweg	396,600	.....	67,620	10,749
Alba-Neck	416,120	.....	.....	9,778
Miami	470,720	.....	.....	8,470
Galena	294,560	.....	19,350	6,980
Cave Springs	344,060	.....	.....	6,535
Oronogo	250,590	.....	.....	5,666
Carthage	236,790	.....	.....	5,208
Lawton	196,980	.....	.....	4,520
Spurgeon	59,480	198,500	3,590	4,000
Springfield	145,230	.....	.....	3,400
Stott City	132,310	.....	.....	2,910
Aurora	76,870	65,500	.....	2,670
Granby	.....	63,370	11,300	1,100
Quapaw	54,820	.....	.....	986
Totals	8,299,350	327,370	952,910	$214,725
2 mos.	72,152,210	4,361,790	11,206,640	$1,965,369

Blende val., the week, $184,562; 2 mos., $1,591,503
Calamine, the week, 4,610; 2 mos., 59,414
Lead value, the week, 25,553; 2 mos., 314,452

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	.....	39.16	.....	54.46	.....
March	39.85	.....	38.45	.....	54.57	.....
April	38.88	.....	37.47	.....	56.37	.....
May	38.25	.....	36.79	.....	55.21	.....
June	40.50	.....	38.18	.....	56.49	.....
July	40.75	.....	38.36	.....	58.81	.....
August	42.50	.....	41.28	.....	60.74	.....
September	42.63	.....	41.29	.....	59.33	.....
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Sixteen inches of snow fell over this district last Tuesday, then drifted in places, to 6 and 15 ft. in depth. It paralyzed the mining industry, except for closed in mines. Miners could not get to their work for two days at any outlying mines. It was a low temperature snow and the temperature has been above freezing ever since. Beside outlying mines those producing silicate were generally disabled most of the week. Long wagon hauls could not be made to advantage and in addition cars were scarce, the railroads being blockaded a couple of days, thus reducing the shipment as well as the output.

Platteville, Wis., Feb. 24—The highest price paid this week for zinc ore was $48; the base price, 60 per cent. zinc, was $46.50@47. The highest price paid for lead ore was $50; the base price, 80 per cent. lead, was $48@49 per ton.

SHIPMENTS, WEEK ENDED FEB. 24

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	889,320	.....	63,900
Galena	610,200	.....	.....
Mineral Point	525,130	.....	.....
Benton	461,700	.....	.....
Hazel Green	380,000	.....	.....
Dodgeville	308,680	.....	.....
Shullsburg	192,300	.....	.....
Harker	164,560	.....	.....
Rewey	142,000	.....	.....
Cuba City	133,700	75,310	158,200
Total	3,807,590	75,310	222,100
Year to date	27,942,290	741,390	1,920,400

Shipped during week to separating plants, 1,843,360 lb. zinc ore.

Other Ore Markets

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less.

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price is for the zinc contents, less eight units at the St. Louis price for spelter; with a deduction of $16 to $18 per 2000 lb. of ore; sellers to deliver ore at smeltery. Penalties may be charged for detrimental impurities. Blende is readily obtainable at Joplin on the basis of 87 per cent. of the zinc content at St. Louis quotation, less $16 for treatment, and less penalties for iron and lime.

Chemicals

New York, Feb. 28—The general markets are reported in fair condition, with some increase in business.

Nitrate of Soda—The market is more active, though the spring trade has not yet fairly started. Prices are again slightly firmer. Quotations are 2.25c. per lb. for spot and futures up to May, and 2.22½c. for later positions.

Arsenic—Demand is fair and spot supplies are rather scarce. White arsenic is quoted at $3 per 100 lb. for spot and $2.75 for futures. Producers are holding out of the market for the present; the price would probably break if offerings were larger.

Copper Sulphate—Business is reported good, but prices are unchanged. Current quotations are $4.90 per 100 lb. for carload lots and $5.15 per 100 lb. for smaller parcels.

Mining Stocks

New York, Feb. 28—Feb. 22 was a holiday. On Feb. 23 trading was again light on the Exchange, but prices firm, and there were small advances in steel common and Amalgamated Copper. There was some activity on the Curb in a few of the copper stocks, but otherwise the market was dull.

On Feb. 24 the Curb reported fair sales of Ray Central, Inspiration and one or two other coppers, with some dealings in Lehigh Valley Coal Sales Co. The Exchange was again dull, but fairly strong.

Feb. 26 the Exchange remained quiet and rather dull. Steel common held its own, but Republic Iron & Steel declined. Nearly all the coppers listed on the Exchange lost a point or so. On the Curb dealing was more active, but irregular. Copper stocks were in demand, at small changes, chiefly downward. Cobalts were slow, but Porcupines active.

Feb. 27 the Exchange continued quiet and slow, with light trading and prices firm. The Curb was more active, but irregular, some stocks advancing and others declining. The copper stocks were about stationary. Lehigh Valley Coal Sales Co. was off several points. Feb. 28 the conditions were practically unchanged.

Boston, Feb. 27—The continued advancing tendency of copper has caused a maintenance of the strength in the share market, although at a minimum of business. The strength holds largely in the Lake Superior group, although the sharp fluctuations in Amalgamated in the New York market have drawn attention to a more or less extent to the entire copper share list. In fact the undertone is good enough to warrant a general improvement in prices.

Mayflower and Old Colony continue to be the active features for the drill showings from the former are by all odd the best ever seen in recent years. Added to this is the attempt to get new representation on the board of directors by banking interests which have been heavy buyers of Mayflower stock recently. Perhaps the most significant fact is the equivalent of a $37 advance in the price of Calumet & Hecla shares to $454, ex-dividend, of the $8 quarterly dividend declaration. Wolverine has advanced $5 to $105, on expectations of increased dividend. Isle Royale has also been conspicuous, both for its strength and activity.

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company	Nov.	Dec.	Jan.
Alaska shipments	1,274,655	4,995,008	3,701,010
Anaconda	20,850,000	23,500,000	26,350,000
Arizona, Ltd	2,960,000	3,100,000	3,200,000
Balaklala	.....	.....	.....
Copper Queen	6,946,775	8,365,265	6,748,264
Calumet & Ariz	4,390,000	4,486,000	4,544,000
Detroit	1,941,498	1,969,313	1,941,970
East Butte	983,405	1,498,000	.....
Mammoth	1,793,181	1,721,404	1,665,319
Mason Valley	.....	.....	600,000
Miami	2,500,000	2,500,000	2,600,000
Nevada Con	5,207,983	4,679,674	6,309,228
Old Dominion	2,082,000	2,610,000	2,044,000
Ray	2,517,000	2,660,000	.....
Shannon	1,256,000	1,255,858	1,550,000
South Utah	361,681	267,514	189,678
United Verde*	2,500,000	2,000,000	.....
Utah Copper Co	9,117,961	9,039,557	8,156,612
Lake Superior*	18,600,000	17,500,000	.....
Non-rep. mines*	8,983,000	8,500,000	8,400,000
Total production	94,265,139	100,647,593	.....
Imports, bars, etc.	17,224,725	21,101,256	.....
Total blister	111,489,864	121,748,849	.....
Imp. in ore & matte	4,767,217	5,159,997	.....
Total	116,257,081	126,908,846	.....
Brit. Col. Cos.:			
British Col. Copper	.....	.....	.....
Granby	.....	.....	.....
Mexican Cos.:			
Boleo	.....	2,645,640	2,315,040
Cananea	.....	3,706,000	3,552,000
Moctezuma	1,682,768	2,864,464	2,732,867
Other Foreign:			
Cape Cop., S. Africa	857,920	701,120	784,000
Kyshtim, Russia	1,170,000	1,570,000	.....
Spassky, Russia	685,440	721,280	.....
Famatina, Argen.	174,720	217,280	.....
Tilt Cove, Newf'd.	.....	.....	153,257
Exports from:			
Chile	4,704,000	5,824,000	8,064,000
Australia	7,168,000	11,200,000	7,056,000
Arrivals in Europe from other count.†	12,064,640	16,331,840	13,144,320

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated. †Does not include the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	United States Product'n	Deliveries, Domestic	Deliveries for Export
II, 1911	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year, 1911	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	.....	.....	.....

	Visible Stocks		
	United States	Europe	Total
III, 1911	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	.....	.....	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. Stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Trading on the Curb has been light, with the cents stocks predominating. Ely Consolidated had a sharp break of 15c. to 36c., on the levying of another 5c. assessment.

Assessments

Company	Delinq	Sale	Amt
Algomah, Mich	Jan. 22	.....	$1.00
Alpha Con., Nev	Feb. 21	Mar. 13	0.05
Andes, Nev	Feb. 7	Feb. 28	0.05
Best & Belcher, Nev	Mar. 19	Apr. 8	0.05
Black Jack, Utah	Feb. 6	.....	0.01
Boston Ely, Nev	Jan. 18	.....	0.50
Challenge, Nev	Mar. 5	Mar. 26	0.05
Crown Point, Utah	Feb. 15	Mar. 11	0.005
Exchequer, Nev	Feb. 14	Mar. 6	0.05
Gold Springs, Nev	Jan. 17	Feb. 3	0.04
Gould & Curry, Nev	Jan. 24	Feb. 13	0.05
Hancock, Mich	Mar. 28	.....	1.00
Kentuck, Nev	Feb. 29	Mar. 19	0.05
King David, Utah	Feb. 13	Mar. 6	0.005
Lehi Tintic, Utah	Feb. 29	.....	0.01½
Lower Mammoth, Utah	Mar. 16	.....	0.01
New York Bonanza, Utah	Mar. 14	Apr. 4	0.02
Ojibway, Mich	Jan. 10	.....	1.005
Raven, Mont	Feb. 1	.....	0.10
Savage, Nev	Feb. 14	Mar. 7	0.10
Sierra Nevada, Nev	Jan. 23	Feb. 13	0.10
Southwestern Miami, Ariz	Jan. 15	.....	1.00
Spider, Utah	Jan. 15	Feb. 15	0.002
Swansea Con., Utah	Jan. 17	Feb. 8	0.01
Tintic Standard, Utah	Jan. 8	Feb. 5	0.00
Union Con., Nev	Feb. 20	Mar. 12	0.15
Utah, Nev	Jan. 19	Feb. 9	0.05
Yellow Jacket, Nev	Jan. 31	Mar. 6	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	.....	23.794	24.081	.....
March	51.454	52.745	.....	23.690	24.324	.....
April	53.221	53.325	.....	24.483	24.595	.....
May	53.870	53.308	.....	24.797	24.583	.....
June	53.462	53.043	.....	24.651	24.486	.....
July	54.150	52.630	.....	25.084	24.286	.....
August	52.912	52.171	.....	24.428	24.082	.....
September	53.295	52.440	.....	24.567	24.209	.....
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	.....	12.611	.....	54.974	.....
March	12.139	.....	12.447	.....	54.704	.....
April	12.019	.....	12.275	.....	54.034	.....
May	11.989	.....	12.214	.....	54.313	.....
June	12.385	.....	12.611	.....	56.365	.....
July	12.463	.....	12.720	.....	56.673	.....
August	12.405	.....	12.634	.....	56.266	.....
September	12.201	.....	12.508	.....	55.253	.....
October	12.189	.....	12.370	.....	55.170	.....
November	12.616	.....	12.769	.....	57.253	.....
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42 529	July	42.400	.....
February	41.614	.....	August	43.319	.....
March	40.157	.....	September	39.755	.....
April	42.185	.....	October	41.185	.....
May	43.115	.....	November	43.125	.....
June	44.606	.....	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	.....	4.266	.....	13.043	.....
March	4.394	.....	4.238	.....	13.122	.....
April	4.412	.....	4.262	.....	12.889	.....
May	4.373	.....	4.223	.....	12.984	.....
June	4.435	.....	4.292	.....	13.260	.....
July	4.499	.....	4.397	.....	13.530	.....
August	4.500	.....	4.406	.....	14.260	.....
September	4.485	.....	4.356	.....	14.744	.....
October	4.265	.....	4.139	.....	15.332	.....
November	4.298	.....	4.181	.....	15.821	.....
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	.....	5.368	.....	23.276	.....
March	5.563	.....	5.413	.....	23.016	.....
April	5.399	.....	5.249	.....	23.743	.....
May	5.348	.....	5.198	.....	24.375	.....
June	5.520	.....	5.370	.....	24.612	.....
July	5.695	.....	5.545	.....	25.006	.....
August	5.953	.....	5.803	.....	26.801	.....
September	5.869	.....	5.719	.....	27.750	.....
October	6.102	.....	5.951	.....	27.256	.....
November	6.380	.....	6.223	.....	26.795	.....
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	.....	14.50	.....	14.81	.....
March	15.90	.....	14.65	.....	14.96	.....
April	15.90	.....	14.65	.....	15.00	.....
May	15.90	.....	14.30	.....	14.72	.....
June	15.90	.....	14.06	.....	14.56	.....
July	15.90	.....	14.03	.....	14.53	.....
August	15.90	.....	14.00	.....	14.47	.....
September	15.90	.....	13.57	.....	14.40	.....
October	15.43	.....	13.44	.....	14.34	.....
November	14.92	.....	13.30	.....	14.25	.....
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Feb. 27

Name of Comp.	Bid.
Acacia	.06
Cripple Cr'k Con	.02½
C. K. & N.	.15
Doctor Jack Pot	.05½
Elkton Con	.60
El Paso	.71
Findlay	.06
Gold Dollar	.15½
Gold Sovereign	.02½
Isabella	.12½
Jack Pot	.05
Jennie Sample	.05
Lexington	.01
Moon Anchor	.01
Old Gold	.03½
Mary McKinney	.48
Pharmacist	.02
Portland	.90
Vindicator	.70
Work	.03

SALT LAKE Feb. 27

Name of Comp.	Bid.
Beck Tunnel	.14
Black Jack	.13
Carisa	‡.15
Cedar Talisman	.02½
Colorado Mining	.36
Columbus Con	.24
Daly-Judge	5.75
Grand Central	.72
Iron Blossom	1.25
Little Bell	.38
Lower Mammoth	.03½
Mason Valley	12.00
May Day	.15½
Nevada Hills	2.30
New York	.03½
Prince Con	1.15
Silver King Coal'n	1.55
Sioux Con	.10
Uncle Sam	28½
Yankee	.15

TORONTO Feb. 27

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.80	Pearl Lake	.20
Hudson Bay	‡70.00	Porcu. Gold	.44
Temiskaming	.35	Porcu. Tisdale	.03
Wettlaufer-Lor	.76	Preston E. D	.06
Apex	.06	West Dome	.45
Central	3.62½	Standard	.21
Dobie	.60	Foley O'Brien	.32
Dome Exten	.43	Rea	.70
Hollinger	10.75	Crown Chartered	.19
Imperial	.05	Swastika	.23

SAN FRANCISCO Feb. 27

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.09
Belcher	.60
Best & Belcher	.15
Caledonia	4.00
Challenge Con	.25
Chollar	.16
Confidence	1.10
Con. Virginia	.93
Crown Point	.59
Gould & Curry	.07
Hale & Norcross	.31
Mexican	3.67½
Occidental	.60
Ophir	1.57½
Overman	.65
Potosi	.10
Savage	.26
Sierra Nevada	.36
Union Con	1.25
Yellow Jacket	.59

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.90
Jim Butler	.36
MacNamara	.19
Midway	.28
Mont.-Tonopah	1.10
North Star	.29
West End Con	1.02½
Atlanta	.15
Booth	.05
C.O.D. Con	.12
Comb. Frac	.14
Jumbo Extension	.23
Pitts.-Silver Peak	1.17½
Silver Pick	.06
St. Ives	.30
Tramp Con	.01
Argonaut	2.00
Bunker Hill	‡5.50
Cent. Eureka	.35
So. Eureka	5.25

N. Y. EXCH. Feb. 27

Name of Comp.	Clg.
Amalgamated	66½
Am. Agri. Chem	58⅜
Am.Sm.&Ref.,com	70⅞
Am. Sm.& Ref., pf.	103⅜
Am. Sm. Sec., pf. B	86
Anaconda	36
Batopilas Min	‡1¼
BethlehemSteelpf	57⅞
Chino	25¼
Federal M.& S., pf.	37¾
Goldfield Con	4⅛
Great Nor., ore ctf.	37
Homestake	‡87¾
Miami Copper	24
Nat'nalLead,com.	53⅞
National Lead, pf.	107¾
Nev. Consol	19¼
Pittsburg Coal, pf.	‡78
Ray Con	17⅛
RepublicI&S,com	16¾
Republic I & S, pf.	66⅜
SlossSheff'd,com.	‡37
Sloss Sheffield, pf.	‡108¼
Tennessee Copper	36¼
Utah Copper	56⅜
U. S. Steel, com	60⅛
U. S. Steel, pf	108¼
Va. Car. Chem	53¼

N. Y. CURB Feb. 27

Name of Comp.	Clg.
Barnes King	‡.35
Beaver Con	.47
Braden Copper	5½
B. C. Copper	4⅛
Buffalo Mines	1.20
Butte & Vipond	‡.53
Butte Coalition	22⅞
Cobalt Central	‡.01
Con. Ariz Sm.	⅛
Davis-Daly	⅜
Diam'field-Daisy	‡9
Ely Con	⅜
Florence	.69
Giroux	4⅛
Gold Hill Con	¼
Greene Cananea	7⅞
Greenwater	.06
Guggen. Exp	180
Inspiration Con	18
Internat. S. & R.	‡128
Kerr Lake	2⅛
La Rose	3¾
McKinley-Dar-Sa	1
Min. Co. of A. new	3⅜
Nev. Utah M. & S.	⅛
Nipissing Mines	7½
Ohio Copper	1⅛
Pacific Sm. & M.	⅛
Porcupine T'nsite	‡.03½
Precious Metals	‡1¾
Ray Central	2¾
Red Warrior	‡1⅛
South Utah M. & S.	‡¾
Standard Oil (Old)	780
Stand'd Oil of N.J.	360
Stand'd Oil Subs.	335
Stewart	1⅛
Tonopah	7¼
Tonopah Ex	1⅜
Tri-Bullion	⅛
Tularosa	¾
Yukon Gold	3¾

LONDON Feb. 28

Name of Com.	Clg.
Camp Bird	£1 9s 3d
Dolores	1 10 0
El Oro	0 16 0
Esperanza	1 16 3
Mexico Mines	7 2 6
Oroville	0 5 0
Stratton'sInd.	0 3 1½
Tomboy	1 1 3

BOSTON EXCH. Feb. 27

Name of Comp.	Clg.
Adventure	6¾
Algomah	6
Allouez	41
Am. Zinc	25
Ariz. Com., ctfs.	4
Bonanza	42
Boston & Corbin	7
Butte & Balak	4¼
Calumet & Ariz	60
Calumet & Hecla	460
Centennial	21
Con. Mercur	‡.03
Copper Range	54
Daly West	5½
East Butte	12½
Franklin	12¾
Granby	35
Hancock	34
Hedley Gold	17½
Helvetia	‡1
Indiana	14½
Island Cr'k, com	44
Island Cr'k, pfd	87
Isle Royale	25½
Keweenaw	1¼
Lake	36½
La Salle	4½
Mass	8¼
Michigan	3
Mohawk	55¾
New Arcadian	‡37⅛
New Idria Quick	7⅜
North Butte	25½
North Lake	6
Ojibway	5½
Old Dominion	46¼
Osceola	115
Quincy	79
Shannon	9¾
Shattuck-Ariz	19¼
Superior	26½
Superior & Bost	3⅜
Tamarack	28
Trinity	5½
Tuolumne	3⅞
U. S. Smelting	35⅞
U. S. Smelt'g, pf.	48
Utah Apex	2⅛
Utah Con	14¾
Victoria	4½
Winona	7¼
Wolverine	104
Wyandot	2⅜

BOSTON CURB Feb. 27

Name of Comp.	Last
Ahmeek	240
Bingham Mines	3½
Boston Ely	1⅜
Boswyocolo	.09
Cactus	.12
Calaveras	1¾
Chief Cons	95
Corbin	2⅞
Cortez	1½
Crown Reserve	21⅝
First Nat. Cop	2½
Majestic	.45
Mazatan	‡½
Moneta Porc	.14
Nevada-Douglas	3⅝
New Baltic	4
Oneco	2⅞
Raven Copper	.33
Rhode Island Coal	.26
San Antonio	‡3½
South Lake	5⅝
Trethewey	.62
Union Mines	‡½
United Verde Ext.	.35
Vulture	‡5⅞

‡Last quotation.